THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1929.] LONDON, MAY 1, 1900. [52ND YEAR. PRICE 6d.

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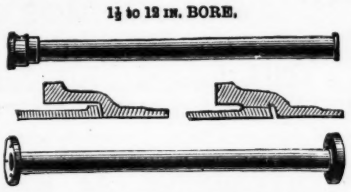

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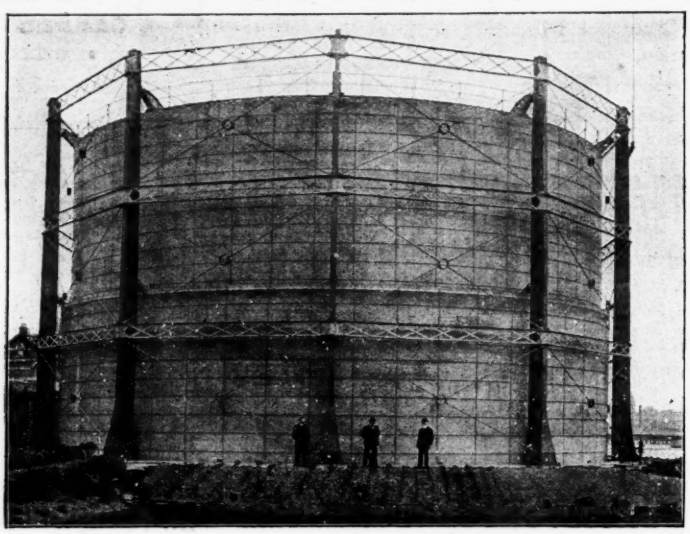

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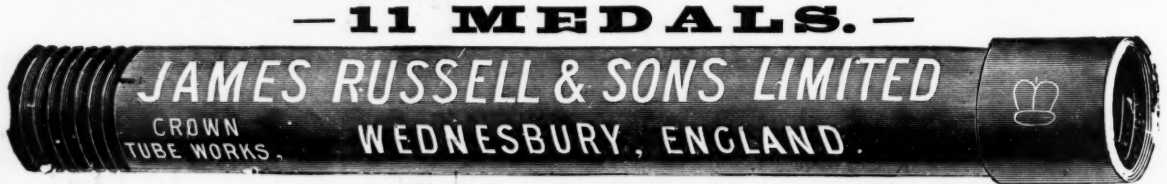

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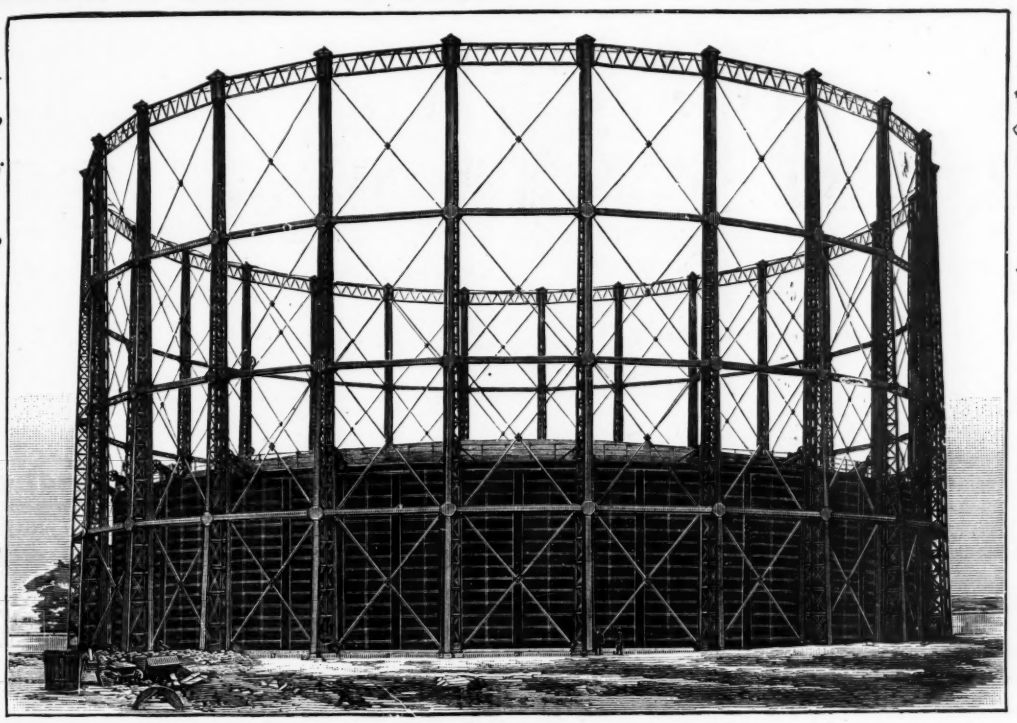

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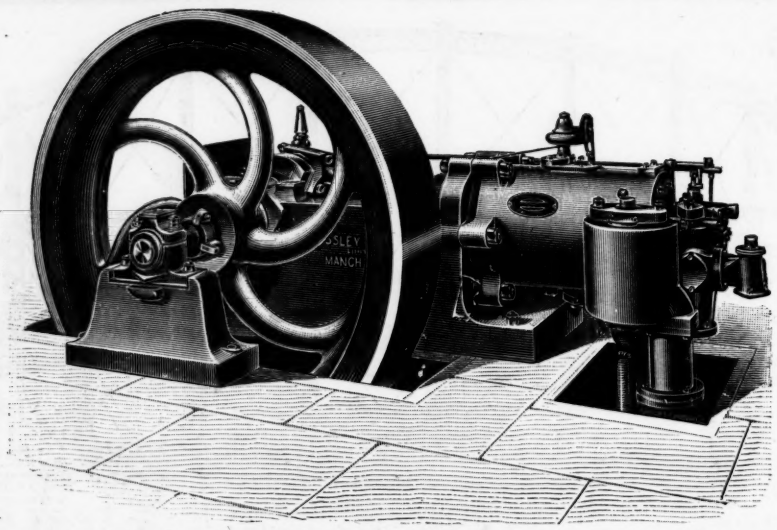

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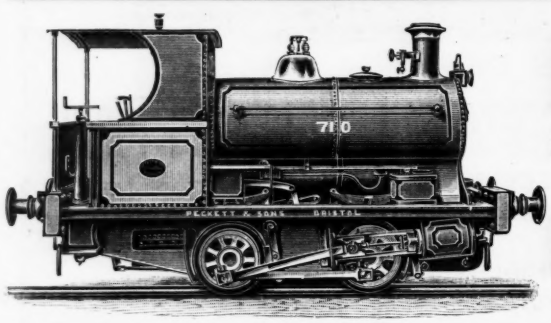

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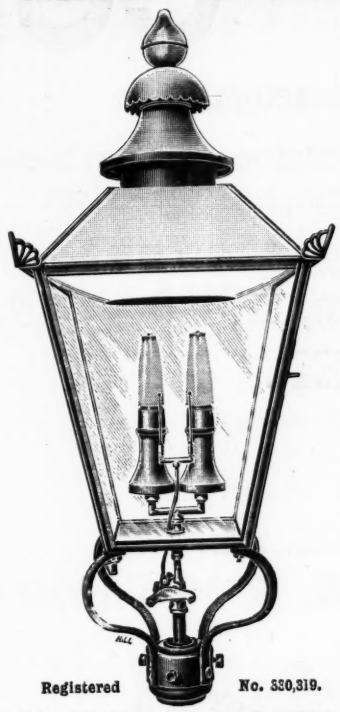

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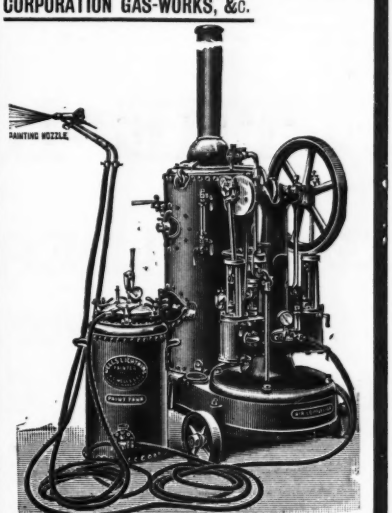

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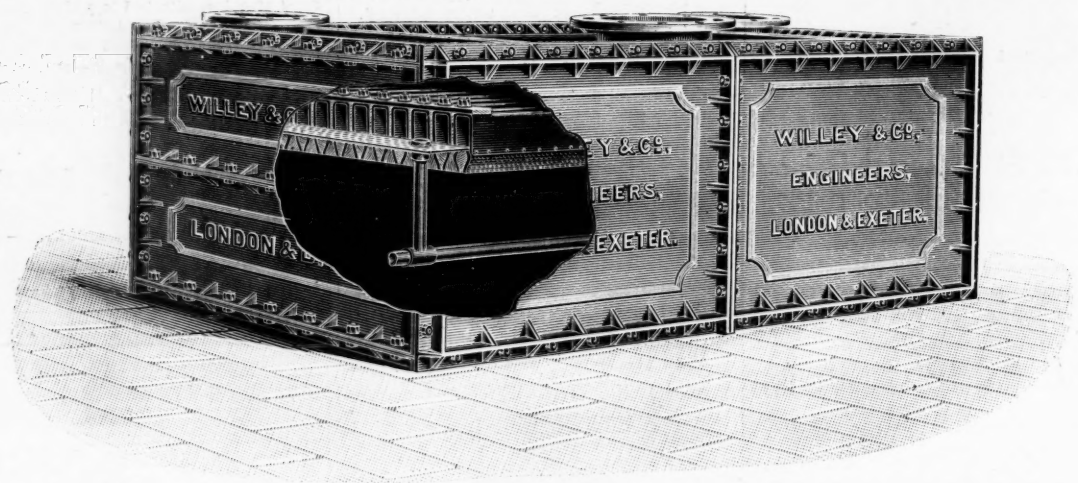

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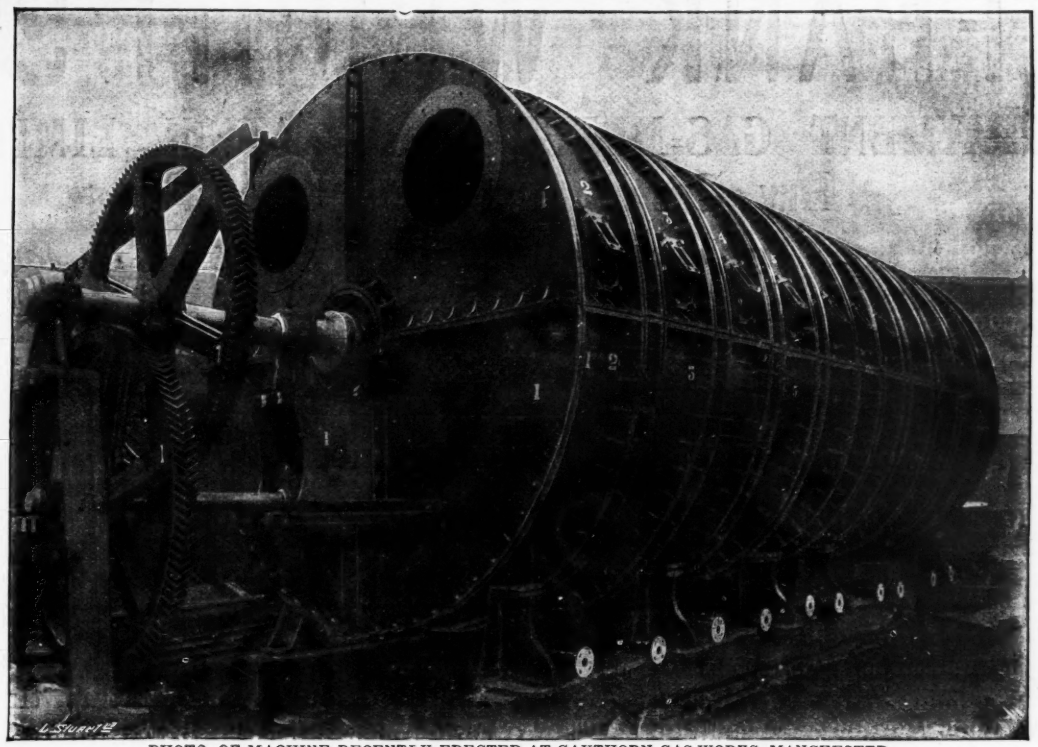

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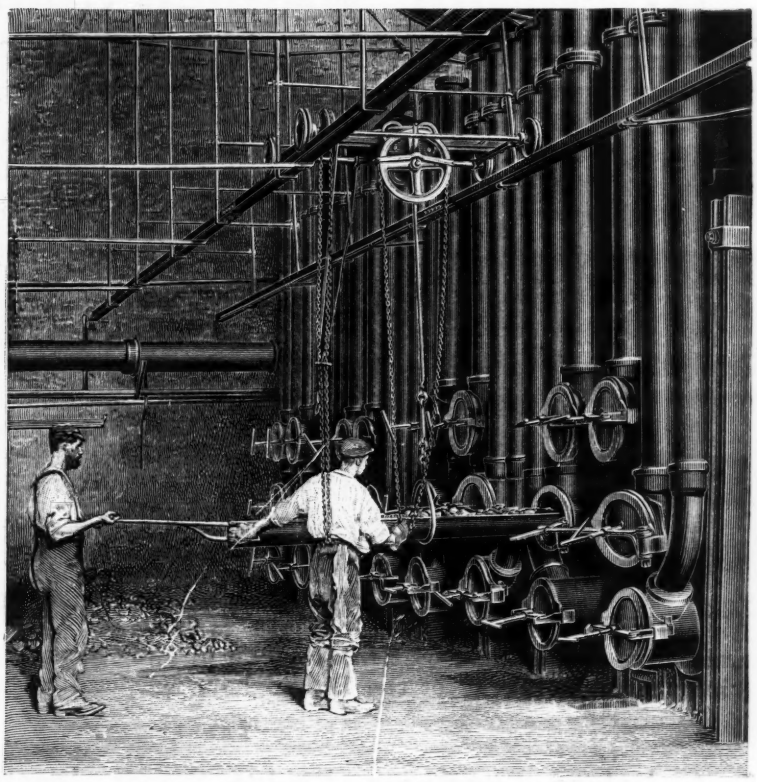

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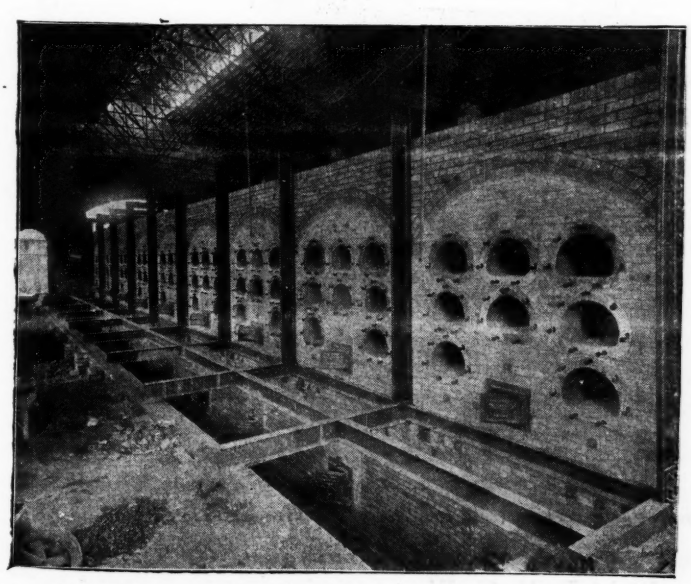

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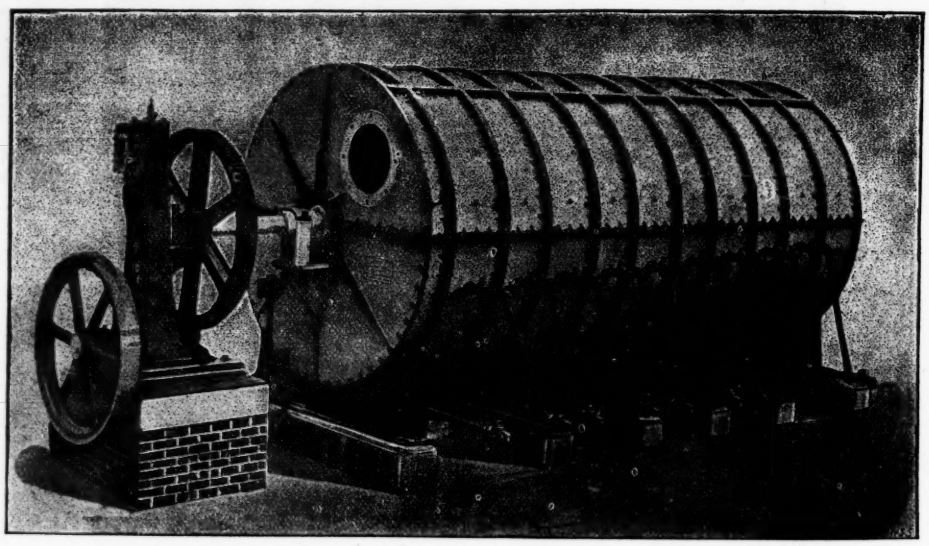

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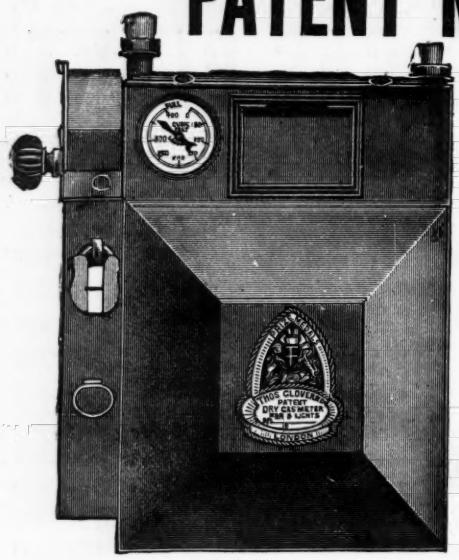

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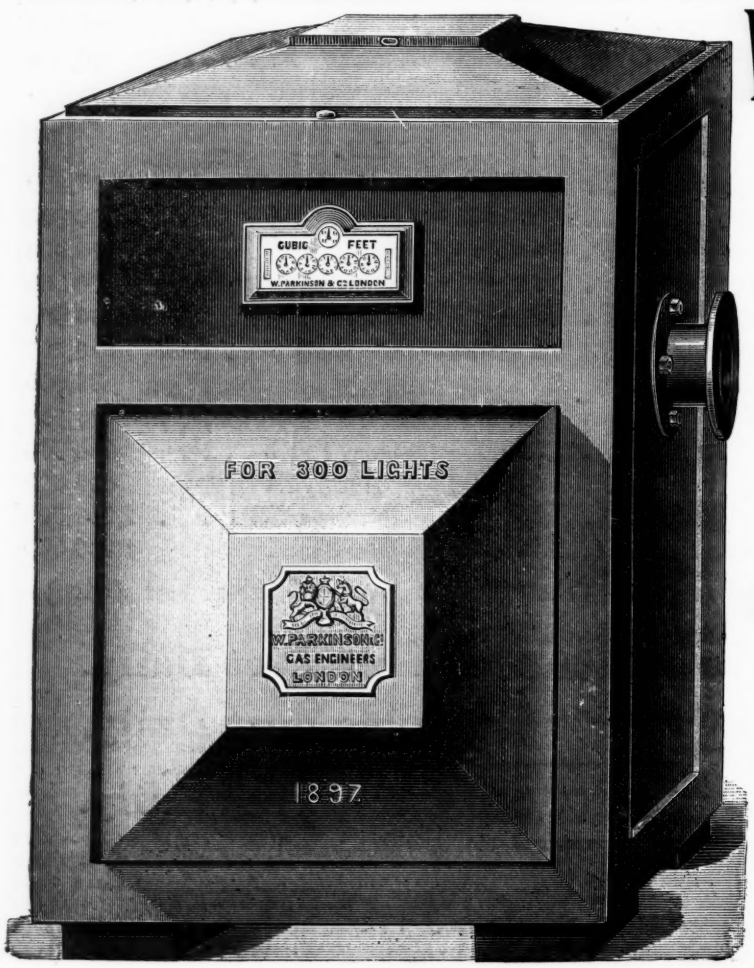

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EDITORIAL NOTES.

The Westinghouse Combination Power Plant.

A GOOD deal of curiosity has been aroused by the strong bid now being made by the Westinghouse interest for a commanding position in the British engineering industry. It is altogether unnecessary to describe that interest here; and it is with some difficulty that one can even approach the subject with any adequate sense of comprehension. A successful man of business or a leader in manufacturing enterprise in the United States has a way of blossoming into an Institution. For some reason, or for many, the prophets of the American dispensation seem to transcend the ordinary limitations of humanity elsewhere, and become vast organizations known by their names. Astor, Vanderbilt, Rockefeller, Edison, Westinghouse—it is really hard to believe that these are the names of men. They share the nimbus of impersonality which always surrounds the original Mahomet or Napoleon. The difference that the American notable usually keeps a shop, only makes him a more mysterious figure still. Mr. George Westinghouse has kept shop in many things in his time; and his latest speciality is gas-engines. When the industrial history of the closing years of the century is written, it will not be his fault if the words "Advent into British trade of George "Westinghouse" do not form the heading of an important chapter. For the moment, our interest in this Westinghouse manifestation has its source in some reflections of what it means in regard to the British gas industry. The British Westinghouse Electric and Manufacturing Company, Limited, have come here to make gas-engines, at works near Manchester which it is understood will be the biggest factory of the kind on earth. The natural question that is suggested by this statement is, Why?

The answer offered is that Mr. George Westinghouse, who should know what he is about, believes implicitly that the gas-engine is likely to be the most generally used prime-mover of the future. He perceives that the whole subject of the generation and utilization of power is now engaging more interest than ever before. He sees what is being undertaken at Niagara in the way of generating electricity for all industrial and lighting purposes by water power; and he believes that the electrical operation of tramways and railways will make headway in the near future, on account of its possessing many advantages over steam. He has for long been familiar with the electrical industry and the pipe-line distribution of natural gas in great quantities; and he has an active interest in the development of large gas-engines. He turns from idle aspirations for more Niagaras to the practical conclusion that the gas-engine, actuated by gas generated at central points, and distributed in pipes as required, will prove the most economical source of power, to be locally converted into, and used as, electricity. This, then, is the new combination which the Westinghouse interest has backed with all its technical and material resources. Whether it is to be justified by the results or not, it is, at any rate, an adventure that is not being undertaken half-heartedly.

It is not for us to say anything about the merits of the Westinghouse gas-engine. That is a matter that must be left to the arbitrament of time. We only wonder whether the Westinghouse scheme will arrest, and turn back, the movement which it is understood, from the examples of Belfast and Leyton, has already set in for the supersession of gas-power electric lighting stations by steam-power stations. That is one thought. Another is the reflection that if gas for Westinghouse engines is to be made and distributed from central stations, those stations will be none other than gas-works, as we know them. Natural gas is of stronger heating power than any artificial gas; but coal and carburetted water gas come next to it, and are the only transportable forms of gaseous fuel. It was the late Mr. Denny Lane who showed the superiority of coal gas to the electric current as a means of power transmission. Now the Westinghouse Company have adopted his prescription, and say, in a pamphlet explaining their method, that "to "convey energy to a distance three essentials—cost, safety, "and reliability—must be considered. These are all con- "served when, instead of conveying the actual power, we "convey the potential ability to create energy. By way "of analogy, the conducting of energy in the form of gas "is to the conveying of power by electric current or other- "wise as the carrying of a million-dollar bank-draft is to "the hauling of a ton and a half of gold." With this very

picturesque image, we will leave the Westinghouse programme for the nonce. Only one remark remains to be offered for the present. The Westinghouse people, speaking of the price of town's gas, aver that this is cheap enough for the economic performance of comparatively small units. "But," they add, "the last word has not yet been spoken. "Experiments which have been long and carefully con- "ducted justify the belief that within a short time gas will "be commercially produced and sold at a cost so far below "the lowest price that now prevails in any part of the "world, that, the three conditions being attained, we shall "enter on a new industrial situation." One would like to know what, if any, justification there is for this decidedly strong and striking statement.

The North of England Meeting.

THIS year's spring meeting of the North of England Gas Managers' Association at Newcastle last Saturday will be memorable on account of the event—happy in more senses than one, but with a shade of sadness in it—which took place after the formal proceedings had ended. As the President said, where could any other District Association be found which could produce two such men as Mr. Cox, of Sunderland, and Mr. Sellers, of York? Both these gentlemen have had a long and a distinguished career at the head of gas undertakings; and they are both still in office. It was fitting that, on the completion of their fifty years of service, the Association should offer them their hearty congratulations, and that these should take a tangible form. On the other hand—although the expression may be a hackneyed one, no more appropriate can be coined—the Association, in doing honour to their veteran colleagues, were in reality honouring themselves. The Association are rightly proud of two such members; and if regret should enter into their reflections, in any form, it can only be that the opportunities for converse with them must, in the nature of things, be now brief and few. The meeting itself, however, is not likely to be looked back upon as one of the bright and lively spots in the history of the body; for Mr. Millard, of Durham, had it all to himself, and he had exhibited more than half of his stock of points for discussion at the previous half-yearly meeting. His paper, read then, and the supplementary remarks contributed now, have certainly been the product of much patient research, and belong to a branch of human knowledge which is more adapted for quiet perusal and verification than for impromptu discussion. Certain managers have preferences for particular arrangements of plant, in the stating of which some show of debate might appear; but the essence of the whole subject was the complexity of all endeavours to govern gas supply, arising, among other causes, from the multi-varying circumstances which are to be found in different places. Therefore, though research were to be carried on to the end of the world, there need be no hope for a state of uniformity being reached. By all means let inquiries such as Mr. Millard instituted, and carried on with conspicuous success, be continued, because the more knowledge which can be secured upon such a vexing subject the better. A perfect instrument was spoken of; but it is to be feared that the only perfectly governed gas supply would be one in which there would be a separate main from the gas-works to every consumer's premises, and a governor upon each main, with a man to look after it. Of course, this reduces all attempts at governing to the position of compromise; and there it must remain. It is the greatest benefit to the greatest number which the gas manager must aim at giving. To discover how to be able to do this is a worthy object of study. Therefore it is to be hoped that Mr. Millard will continue the work he has so well begun; and that others may be induced to emulate him.

The Excuse of "Unavoidable Cause."

IT is worthy of notice by those responsible for the conduct of gas undertakings which are under obligations to maintain the supply once given to any consumer, according to the terms of the Act, that several Electric Lighting Companies of London have recently been haled before the Magistrates for failure to fulfil their statutory engagements. In one set of complaints, the Company pleaded guilty to having been too greedy of custom. They took more customers than they could properly serve; and for the inevitable consequential default they were fined, and admonished not to do it again. On the other hand, for failures by the same Company which were shown to the Magistrate to have proceeded from different causes, and to have been unavoidable, there was no punishment. This merciful judgment was given so naturally, that it requires a little particular criticism to see, in the excuses which exculpated the Company, the same plea of *force majeure* that prevailed in another Court to excuse another offending Company. It is remarkable that only in Electric Lighting Orders has this significant term *force majeure* been admitted to English law phraseology. It is an amplification of the old English legal expression "act of God," descriptive of some unavoidable catastrophe preventing the fulfilment of a contract. Gas and water supply are peculiarly exposed to accidental interruptions; but long experience, ample resources, trained foresight, and ceaseless vigilance usually avail to keep the public from suffering inconvenience or loss thereby. Still, Gas Companies have never professed to be able to work miracles; and they cannot perform either physical or economical impossibilities. For instance, to make gas at the same price as before with coals at double the cost, is an impossibility, unless something very exceptional comes in to help. Yet it is quite likely that some people who have had to pay 35s. a ton this spring for the same coal that they bought last year at 25s. per ton, will protest against the Gas Company putting another 6d. per 1000 cubic feet on the price of gas to help them to pay their coal bills. Similarly, although Gas Companies are bound to do everything in their power to keep up the supply, a real, strong, combined sudden strike of all hands employed in the works would surely excuse the management from continuing the business. There have been occasions when the political partisans of strikers who have caused Gas Companies some temporary inconvenience, have striven to set in action against the same Companies the ordinary legal remedies for such shortcomings as their own friends' performances brought about. But the infantile guile of this behaviour is not less illicit than contemptible. A London Electric Lighting Company have been excused for making default in their supply because they could not get supplies of the description of coal they wanted, and because some new boilers on order were not delivered to time. This is a fairly liberal interpretation of *force majeure;* and it will not be lost sight of.

The Performance of Street-Lamps.

THE instructive diagrams with which Mr. J. H. Sheldrake illustrated his Eastern Counties paper on lighting, deserve attention altogether apart from whatever particular application was given to them by the author. It is not often that anybody takes the trouble to make a study of street lighting effects on the spot; and Mr. Sheldrake merits warm thanks for his exposition of the actual facts of public street lighting by the three different kinds of light tested. Experiments of this nature are very troublesome to carry out, and require expensive apparatus, besides needing to be carefully worked out afterwards if their indications are to be of any real use. How necessary work of this kind is, however, is shown incidentally by the circumstance that the two incandescent electric lamps, supposed to be of 16-candle power each, were only yielding a lighting effect of some 24-candle power together. One hears a great deal in these days about the portable photometer, regarded as a means of keeping Gas Companies up to the mark. What the electricians would say about it if the same measure of inspection were meted out to them, has not yet transpired. It is to be noted that Mr. Sheldrake's determinations of lighting effect are very consistent; all the light-sources showing the same proportionate effect of distance. Future writers on artificial lighting will not overlook this contribution to the technical record of the subject. As will be gathered from the necessarily much-condensed abstract which appears in another column, General Hickenlooper has read a paper on "Street Lighting" before the Ohio Gas Association. It is a mine of information relating to many branches of the subject.

Toujours Coal!

IN the course of his remarks on the present coal difficulty at the recent meeting of the Eastern Counties Association, Mr. R. G. Shadbolt spoke of the possibility of imports of coal into Europe from America—a question which, it may be remembered, was discussed in the "JOURNAL" some two months ago (*ante*, p. 670). In this connection, we would refer our readers to an article which recently appeared in the "Iron and Coal Trades Review," under the title of "The American Coal Bogey," and which can be read with

interest by all who are anxious to see an end to the present inflated condition of the coal market. The writer takes the view that it is only possible for American coal to compete with English in the European markets at times of abnormal scarcity and dearness of coal in this country, and that the suggestion that coal exports from America may become, in the course of a few years, as important as those of corn and cotton, will, when English prices resume their normal level, appear as little short of ridiculous. In the meanwhile, however, American coal is now being delivered both in Italy and Austria; and every ton so imported stops an order for a ton of English coal, and therefore helps forward, be it never so slightly, the time when the inevitable fall of prices to their normal level will take place. That time, it may be noted, will, in the opinion of the writer in the "Iron and Coal Trades Review," probably be reached within the next two years, and possibly within twelve months. A consummation devoutly to be wished! We should not, however, like to commit ourselves to a prophecy of a return to "normal" prices within twelve months; for, with the wages factor to take into account, and the possibility of trouble with the men when the reaction sets in, and it is sought to materially reduce wages, it is probable that the return to the level of what we have been accustomed to consider reasonable prices will be some while in its accomplishment, and it has not yet commenced. We are prepared to see it begin within the period suggested, and expect to see gas coal bought this time next year at a very considerable reduction compared with prices now ruling; but it would not be wise to count with certainty upon only paying advanced rates for the ensuing year.

So far as that period is concerned, the situation has practically been settled; for we hear on every hand of forward contracts being executed at rates above rather than below the price which, writing a month ago, we named as being that at which the next twelve months' requirements would probably have to be bought, unless the coalowners could be induced to adopt a more reasonable attitude. We then gave reasons for holding that there was little prospect of the collieries abating their demands, and spoke of 15s. 6d. per ton, "f.o.b." in the port of shipment, as likely to be the best terms to be had for Durham gas coal. We now hear, from a quarter in the market that is usually well informed, that the largest Metropolitan Company have purchased three-fourths of their requirements up to June of next year at prices equal to about another shilling a ton above that we estimated, which means, in round figures, a sovereign a ton "c.i.f." Such purchases (equal to about 1½ million tons) naturally serve, to a large extent, to fix the market for the period they cover.

What such a price for coal will eventually mean for gas consumers north of the Thames remains to be seen (for the Horseferry Road authorities will probably not make any pronouncement on the subject until after the close of the parliamentary session), though it can be fairly well surmised. The Chartered Company, it will be remembered, carried forward, after paying their last dividend, £193,333 —equal to about 2¼d. per 1000 cubic feet per annum on their output. Bearing in mind the high return for residuals this half year, and that the Company's present coal contracts do not expire until the end of June, they will probably have a carry-forward at that time equal to 3d. per 1000 cubic feet for the ensuing year. As, however, in addition to higher cost of fuel, Gas Companies have all of them to face heavy increases in the cost of materials required for repairs and renewals, and also for purification, it is not easy to see how, on the most favourable assumption, the consumer north of the river is to escape another 6d. on the present price of 2s. 11d.

A Hint to the London County Council.

During the past fortnight, London newspapers of all shades of political opinion have joined in the cry that the London County Council ought to step in and run the Thames steamboats, in order to save from extinction a time-honoured service, and preserve a valuable attraction to sight-seers. It is very curious to mark the diverse and ingenious ways in which this appeal to Municipalism to make good the failure of private enterprise is justified by the different journals. Of course, the organs of Progressive opinion have no hesitation in proving that this particular branch of municipal trading is all of a piece with the recognized "program" of the County Council. The newspapers which usually revile the Council and most of its works, as easily show that, if that body wants to make itself really useful to Londoners, this is its chance. The various journalistic voices, however, are hopelessly discordant when it comes to suggesting how the waterway of the Thames should be utilized for passenger traffic between bridges. It cannot be gainsaid that the old penny steamboats have not paid their way for many years, for a variety of reasons. First, and chiefly, the traffic is insufficient in quantity; and it is doubtful whether more could be attracted to the river route even by providing a fleet of new boats, with protection against the weather, and running frequently. A large amount of capital would be needed even to make an experiment, though otherwise nobody can say what might be the possibilities of the route. In the meantime, how clearly the situation thus disclosed proves the difficulty of settling the problem of municipal trading on general principles! It has been stated that the London County Council would not be justified in taxing the ratepayers to the tune of £5000 a year—the estimated loss on a river steamboat service—for this particular object. But that the object is in itself a desirable one is generally agreed. It seems also pretty clear that, if the County Council does not undertake to provide the service, nobody else will. Now, there is a way by which the Council well might do it, not only without throwing any additional burden upon the ratepayers, but even at a saving on its general budget. If the Council would only accept the verdict of Parliament and of the Royal Commissions on its "water policy," stop the waste of money on this hopeless account, and at the same time cease worrying the Gas Companies and all the other usual subjects of its superfluous attentions, the cash thus saved would more than suffice to place upon the river the finest passenger-boat service of any capital city of the world.

Sensible Trade Unionists in Council.

Really, if the Scottish Trade Unionists could be taken as fully representing the Trade Union movement, we should have to reconsider the attitude of reserve, not to call it suspicion and distrust, which the "Journal" has been driven to maintain with regard to the official Trade Unionism of England. The fourth annual Scottish Trades Union Congress was held last week in Edinburgh, and the Corporation of Edinburgh did not see fit to extend a municipal welcome to the gathering. This Corporation coolness was actually defended by the President of the Edinburgh Trade Council, who remarked that these formal municipal ceremonies result in the talking of a "certain amount of "platitude," which is a thing that "could not honour any "man;" and that therefore they might well be dispensed with. Shade of the Reformers' Tree! A Trade Union delegate objecting to what Thomas Carlyle used to call "windbaggery!" Any man who should speak in this sense in the South would be in danger of the London County Council. Of course, the President's address was tinged with "Labour Party" politics; but he said at least one memorable thing. Touching on the familiar question of such meetings—that of the direct representation of Labour in Parliament—the President remarked that he should "like "to see the working man in a different frame of mind before "payment of members and election expenses out of the "public purse came into operation." To introduce such a measure at present "would not advance labour repre-"sentation at all; it would only benefit the scallywag, the "'stickit' professional man, and gentlemen of like stamp, "who, with oily tongues and elastic consciences, would "reduce cajoling of the working man to a fine art." This is more common sense than has been heard at any Trade Union Congress whose proceedings we have followed. The last English one was rebuked by a lady member for its helpless, hopeless twaddling over generalities. The Scotsmen seem to be of a different mould; and if they go on like this, they will earn the respect of those who differ from them in some matters of opinion.

*** In our issue of the 24th of April, we published an article, headed "The Coal Famine and the Public," taken (as we stated) from "The Times" of the previous Thursday. We regret that the publication of the article was made without our first obtaining the permission of the Proprietors of "The Times" to its reproduction in our columns.

WATER AND SANITARY AFFAIRS.

In view of the projects already sanctioned and those which have been formulated for the construction of additional reservoirs in the valleys of the Thames and Lea, the subject of the rating of these important adjuncts of a water-supply system is one of very considerable interest, alike to the owners of the works of which they form an indispensable part and to the authorities of the parishes in which they are located. They necessarily occupy large tracts of land which might, but for their presence, be utilized for pasture, or possibly building, purposes. The Local Authorities in the Thames Valley view with no little concern the prospect of an almost unbroken chain of water reservoirs extending from Wraysbury to Hampton, inasmuch as, apart from the danger to health which they consider would be caused by the humidity of the atmosphere produced by this series of artificial lakes, the land in their vicinity would, as they assert, be deteriorated in value, and moreover—and this is a far more important matter from their point of view—these extensive structures would only be rated, as the law now stands, at one-fourth of their value. It is stated that the Hampton District Council lose in this way £1862, and neighbouring Local Authorities smaller sums amounting to £3650. It was only natural, therefore, that the above-named Council should endeavour to ascertain whether the existing method of rating reservoirs is the proper one; and they set about the work in a summary fashion by raising the rates in respect of the reservoirs of the Southwark and Vauxhall Water Company. The Company resented this attempted interference with the established practice, and declined to pay the higher charges. The matter came before the local Justices, who, it may be remembered, supported the view taken by the Council. But the Company appealed to the Higher Court, and were successful. Nothing daunted, the Council carried the case to the House of Lords, only to fail in upsetting the decisions of the two tribunals immediately below. The Council accordingly had, doubtless reluctantly, to conform to the law.

The dictum of the octosyllabic poet as to the condition of the man who complies against his will is, however, as true now as it was in the time of the Commonwealth. The Council are "of their own opinion still;" and it is shared by their neighbours at Sunbury, as well as by other Local Authorities in the Thames Valley and elsewhere. It was notified in the "Journal," shortly after the pronouncement of the decision of the House of Lords, that steps would be taken to obtain an amendment of the law, and that a conference would be convened for the purpose of considering the best method of proceeding. This, as will be seen by the report which appears in another column, was held last Wednesday, at the Cannon Street Hotel, and was numerously attended. The initiative in the matter was taken by the Sunbury District Council, whose Clerk (Mr. C. E. Goddard) undertook all the preliminaries in connection with the meeting. The tone of the speeches was, on the whole, moderate; the few very hard words used having reference to the existing law rather than to those who are only acting in accordance with it. The Local Authorities consider that large receptacles for the storage of water which have been formed by the skill of the engineer for the use and to the profit of a commercial undertaking should be rated on a higher scale than natural ponds or lakes, on which no such skill has been brought to bear; in other words, that the latter are, in the language of the statute, "land covered with water," whereas the former are, so to speak, storehouses of water, and part of the machinery by which the supply is furnished to the consumers. They are, it is stated, supported in this view by no less a legal luminary than Mr. Littler, Q.C., the Chairman of the Middlesex County Council, as well as by Sir F. Dixon-Hartland, M.P., the Chairman of the Thames Conservancy Board. On the other hand, the Companies have the support of the law as well as several decisions enforcing it.

In the last of these judgments in their favour—the one which has given rise to the present movement—the Lord Chancellor emphasized the point that when Counsel was asked: "If a reservoir is not land covered with water, what is it?" he was unable to give any other reply than that it was "a reservoir." His Lordship confessed his inability to understand the ground on which he and his learned brethren were asked to "disturb, or throw any "doubt upon," the construction of the words which had prevailed for a very considerable period. He thought the case was perfectly clear; and the Council's appeal was dismissed, with costs. As already mentioned, the parties aggrieved by the law as it stands took the first steps in the direction of obtaining its amendment at the conference last Wednesday, when it was unanimously resolved to form an Association of Local Authorities to take up the matter, and apply to the Home Secretary and the President of the Local Government Board to bring in a Public Bill to carry out the object sought. Should this be done, the Water Companies, whose revenues would be considerably affected by the proposed change in the basis of rating, will have to incur further expense in defending their interests from attack, although they are admittedly not responsible for the law which will give rise to it.

North British Association of Gas Managers.—The Secretary of the Association (Mr. R. S. Carlow, of Arbroath) has issued the usual circular preliminary to the annual meeting, which will take place in Edinburgh next July, under the presidency of Mr. W. Ewing, of Hamilton. He reminds the members that the Committee are now making the necessary preparations for the gathering, and invites their co-operation in rendering it at least equal in interest and profit to any of the meetings which have preceded it.

Sulphate of Ammonia Manufacture in France.—Supplementing the particulars on tar distillation in France recently reproduced in the "Journal" from the "Génie Civil," this publication has lately given the following: "In the North and North-West districts there are two kinds of sulphate producers—first, the gas-works, particularly the two at Lille, which sometimes manufacture alkali and at other times sulphate; then the works at Roubaix, Tourcoing, and Rouen. The entire production of these works cannot be ascertained; but the combined gas-works of France, except those of Lyons and Paris, which are classed separately, produce 4000 metric tons of sulphate. In addition to these sources are the regenerative coke-ovens."

A Century of Chemistry at the Royal Institution.—Professor Dewar, Fullerian Professor of Chemistry, on Thursday last delivered at the Royal Institution the first of a series of four lectures on the above subject. He said Davy and Faraday dominated the Institution for fifty years, and commenced the investigations which they were carrying on at the present day. The work done by these professors laid the foundations of the present modes of work. Davy was probably one of the most remarkable geniuses of the age, on account of the methods of experimental work which he taught. Alluding to Davy's work at the Royal Institution, Professor Dewar mentioned his experiments in connection with water gas, analyzing air, and measuring gases; and he gave examples of the methods adopted by him, and the results obtained.

The Bacterial Treatment of Crude Sewage.—As a supplement to the second report on the bacterial treatment of crude sewage at Barking and Crossness, to which reference was made in the "Journal" for the 24th of October last (p. 998), Dr. Clowes and Dr. Houston have presented to the Main Drainage Committee of the London County Council some notes on the deposit which accumulates on the coke fragments of beds. The deposit contains some fine particles of coke and sand grains, and also cotton and woollen fibres and diatoms; but it consists largely of chaff, straw, and woody fibres. As this deposit increases, the capacity of the beds decreases. A series of gaugings of a 13-feet coke bed showed that the decrease of capacity was proceeding at the rate of 1 per cent. of the original capacity per week. Dr. Houston says the practical bearing of his experiments seems largely to depend upon whether the effluent is discharged into a stream used for drinking purposes, or otherwise.

Gas Undertakings and the London Building Act.—Gas undertakings in the Metropolis have recently been held (in the case of the Wandsworth and Putney Company) to be subject, in regard to the construction of gas-works or other buildings, to the provisions of the London Building Act of 1894. It is not perhaps generally known that a tribunal exists to which applicants for consents under that Act, who may deem themselves aggrieved by the decisions of the London County Council or the District Surveyors, or by the conditions attached to such consents, may appeal; and, moreover, that the tribunal has power to hear appeals either by the parties interested in person, or by counsel, solicitor, or agent, as the appellant may desire. The course of appearing in person, or by agent other than a lawyer, is naturally the least expensive, and a manual has been prepared by Mr. C. H. Love (Clerk of the Tribunal) for the guidance and assistance of appellants so desiring to be heard. All the regulations as to the procedure to be followed, and fees to be paid, in respect of such appeals, and the constitution and powers of the tribunal (which is composed of three members, appointed severally by a Secretary of State, the Council of the Royal Institute of British Architects, and the Council of the Surveyors' Institution), are explained at length; a schedule of the appeals heard and decided up to the present time is appended; and a suggested form of notice of appeal is given. The book is published by Messrs. P. S. King and Son, of Westminster.

INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE GENERAL MEETING,

HELD AT THE

INSTITUTION OF CIVIL ENGINEERS,

MAY 1ST AND 2ND, 1900.

Mr. J. W. HELPS, M.Inst.C.E., of Croydon, President.

INAUGURAL ADDRESS.

Gentlemen,—In placing me in the presidential chair, you have done me an honour which I need hardly say I appreciate more highly than I can find words to express; and although the position is one which brings with it many responsibilities and some anxiety, I trust that, with your assistance and forbearance, I may succeed in carrying out the duties of the office in such a manner as to merit your approval.

It will, I think, be naturally expected that some portion of my remarks will be devoted to the consideration of the suggested amalgamation of this Institution with the Gas Institute. Inasmuch, however, as the matter will be laid before you at a later period of our proceedings, I do not propose to deal with it in any detailed manner.

No one interested, however little, in the gas industry can possibly consider the present position of affairs, and the condition which has prevailed during the past ten or twelve years, without coming to the conclusion that the existence of two Institutions, each claiming to represent the gas engineering profession, is unwarranted, and not only likely to cause a certain amount of unnecessary personal feeling between members of our profession, but liable to interfere with that progress and prosperity which I feel sure it is the wish of all concerned to see associated with our industry. The circumstances connected with the unhappy events which eventually led to the secession of so many members of the Gas Institute, and to the formation of a new Society, must be too well known to need any present comment.

For some time past, members of both Institutions have taken frequent opportunities of discussing the subject, and of testing the feelings which might exist among the members of the two Societies with regard to reunion; and when the matter came to be more formally approached, it was gratifying to find that apparently no difficulty existed which was in any way likely to prove an insuperable obstacle. As you have already been made aware from the report of the Council, a small Joint Committee was formed, who, after holding several meetings, and carefully and dispassionately discussing the whole question, eventually formulated a set of rules which, while differing in one or two particulars from those of the present Societies, should, I think, provide a basis for a thoroughly sound and representative body.

It will be at once apparent that the difficulties which will have to be surmounted by the Gas Institute are greater than in our case. A glance at the new rules governing the qualifications for membership will make it obvious that many of those belonging to the Institute will be no longer eligible. I, of course, allude to those who, though interested in the gas industry, are not practically engaged in the management or direction of gas undertakings, but who owe their inclusion to the fact that they are concerned in the supply of various apparatus, material, &c., used in or about a gas-works. Now, while acknowledging the many advantages which might accrue to an Association from the inclusion of the names of many of these gentlemen, and while recognizing the many benefits which our industry has derived—and will, I trust, continue to derive—from their efforts, I cannot help feeling that the experience of past years indicates that it is necessary for the success of an Institution which is to represent our profession, that it should be constituted of those actively engaged as Gas Engineers or Managers, and of those only; and I am strongly of opinion that this belief is shared by the principals of most of the firms who are directly or indirectly represented in the Gas Institute.

The success of the industry means much to the welfare of such firms; and surely it would be a suicidal policy on the part of their principals to persist in any action which the members of our profession might view as distasteful. I have far too great a belief in their common sense, as well as in their ideas of justice, to think that for one moment they will permit any action on their part to interfere with the efforts of those who are at the present time striving to bring about the much-to-be-desired re-union. Should the scheme be favourably received and eventually accepted, our industry would be represented by a body which, numbering about 800 members, and having an annual revenue derived from subscriptions alone of nearly £1500, should, I cannot help thinking, be strong enough and wealthy enough to be capable of carrying out more useful and more important work than has so far been achieved by any such Association.

I do not think it can be denied that, in the earlier days of gas manufacture, managers of works were men who held their positions by the possession of strong natural intelligence and undoubted energy, but who, through no fault of their own, were hardly possessed of that early training which fitted them for acting in any other capacity than that of manager. The consequence naturally was that when extensions were required, and the services of a consulting engineer not called in, the preparation of drawings and submitting of plans and specifications were left to the contractors, while matters requiring chemical knowledge of anything more than an elementary character were probably altogether neglected. The result has been, therefore, that much of our engineering progress, and much that we have learnt of the chemical side of our profession, is due to the efforts of those somewhat outside our immediate circle.

Now I do not, of course, mean in any way to belittle the efforts of those who bore the burden and heat of the early, and probably troublesome, days of gas manufacture. There are many whose names could surely not be included in such a category as I have above sketched, and many who, though not either strictly speaking engineers or scientists, have left their mark on the field of progress of our industry in no indistinct fashion. In spite, however, of the spread of education, and more especially of technical education, which has enabled the youth of the present day to acquire information with the minimum of exertion and but little expense, I am forced to the conclusion that it is anything but creditable to the gas industry of Great Britain that it has taken so little share in the promotion of scientific education generally, or in providing facilities for chemical and physical research, or experimental engineering.

I do not intend to recapitulate the suggestions which were contained in my Presidential Address to the members of the Southern District Association of Gas Engineers and Managers in 1897, nor the stirring words in which our ex-President referred to the same question in his address before this Institution last year—I refer, of course, to the "Establishment of Experimental Works and Chemical Laboratories." The subject, however, is to me of such paramount importance that I am loth to lose the opportunity of again bringing it before you to-day. So far, the various suggestions made have failed to provoke any discussion in the columns of the Technical Press—and this in spite of certain editorial allusions, which certainly paved the way for the full consideration of the questions involved. Let me content myself for the present by asking you, and indeed all members of our profession, whether, in the event of the amalgamation to which I have alluded being brought about, a fitting opportunity does not present itself for the formation of a strong Committee to carefully consider the advisability of establishing in some way or other a Chemical and Physical Laboratory, with properly qualified principal and assistants.

Our industry owes a debt of gratitude to those companies and corporations who have recognized the value of the services of skilled and trained chemists on their staff; and the services that these chemists have rendered to the industry cannot be too highly appreciated. Again, many engineers are themselves chemists of repute; and the work that they have done in this direction I, for one, wish to heartily recognize. But, appreciating as I do the fact that upon chemical investigations and physical research the prosperity of our industry depends in no small degree, I am bound to say that the efforts of those to whom I have alluded are not sufficient to bring about such satisfactory results as would be obtained if supplemented by the work

which could be so well and thoroughly carried out in a properly organized and carefully managed laboratory.

There is, I fear, but little doubt that the outlook for gas companies is at the present moment darker than it has been for many years. The extraordinary rise in the price of coal—which I believe I am right in saying is quite unjustified, and due to causes which, in my judgment, have never been satisfactorily explained—appears to me to render it absolutely necessary that gas companies generally throughout the country should make a considerable addition to the selling price of gas. Now, although such a rise can hardly need any justification in the eyes of the public, still it goes without saying that such an action is likely to have a prejudicial effect on the consumption of gas, especially as the rise in price must give to electric lighting authorities a certain advantage of which doubtless they will not be slow to avail themselves.

Oil, too, has—no doubt partly as a natural consequence—nearly doubled in price, and this will add very considerably to the cost of the manufacture of carburetted water gas. It will not, however, as far as I am at present in a position to judge, increase the expense to an extent equal to that which will be the case with coal gas—assuming that coal contracts are made at the prices which are at present being demanded. It is therefore in this serious crisis the duty of all engineers and managers to consider very carefully every claim which promises to reduce the cost of delivering gas to the consumer, and also the best methods of keeping up the consumption under the altered conditions.

With regard to the first point, over two years' experience of the manufacture of water gas strengthens my belief that gas companies possess in this process a means whereby the cost of producing gas can be kept lower than would otherwise be possible. This may not, of course, prove to be the case generally—so much naturally depending on local circumstances; but that it has been the experience of the Company with which I am more particularly interested, I will endeavour to show.

The manufacture of water gas was commenced at Croydon in January, 1898; the necessary enrichment prior to that date being obtained partly by means of cannel, and partly by carburine in the Maxim-Clark carburetter. The average illuminating power of the gas in 1897 was 15·01 candles; and the cost of gas into the holder was 14·10d. per 1000 cubic feet, as shown by the following figures.

1897.

Dr.	£	*Cr.*	£
Coal and cannel, &c..	43,486	Coke	15,826
Purification	1,457	Breeze	1,362
Salaries	1,812	Tar	3,748
Wages	9,161	Sulphate	2,897
Repairs and maintenance	7,433		
	£63,349		£23,833
	23,833		

£39,516 = 14·10d. per 1000 cubic feet made.

I should mention that in the above year the charge for wear and tear was unusually low; being only 2·86d. per 1000 cubic feet made, against 3·60d., the average of the seven previous years. Had the figure, therefore, for 1897 been the same, it could easily be seen that a considerable addition would have to be made to cost of production.

The cost of making gas of an illuminating power equal to 16·15 candles in 1899, when about 30 per cent. of carburetted water gas was used, was 13·07d. per 1000 cubic feet, made up according to the following figures.

Dr.	£	*Cr.*	£
Coal and oil	43,674	Coke	20,535
Purification	2,540	Breeze	1,478
Salaries	1,939	Tar	2,655
Wages	8,254	Sulphate	3,283
Repairs and maintenance	11,531		
	£67,938		£27,951
	27,951		

£39,987 = 13·07d. per 1000 cubic feet made.

I have taken the above figures for 1899, and having calculated the amount of coal and cannel necessary to produce the gas made of the required illuminating power—5 per cent. of Boghead cannel (which, I believe, is a low estimate) being assumed as necessary—I have substituted this material for oil, and have thus obtained the following estimated statement, which shows that the cost of gas would have been 14·71d. per 1000 cubic feet, or 1·64d. per 1000 cubic feet in excess of what it was as shown by the published balance-sheet.

Dr.	£	*Cr.*	£
Coal and cannel	56,540	Coke	28,007
Purification	1,529	Breeze	2,070
Salaries	1,939	Tar	3,300
Wages	11,012	Sulphate	4,594
Repairs and maintenance	11,531		
	£82,551		£37,971
	37,971		

£44,580 = 14·71d. per 1000 cubic feet made.

I should state that in the above figures the allowance for coke is calculated on the full average price realized; although I think I should have been justified in taking it at a lower rate, as I believe that had the excess quantity been produced, the price received per ton for the whole would have been somewhat lower. I have adopted the same principle with regard to breeze, tar, and sulphate of ammonia; while on the other side, purification and wages have been charged on the average of the four previous years—a slight addition, however, being made to the wages to compensate for the rise granted to workmen in the year 1898.

It may now be of interest if I give the actual cost of manufacturing carburetted water gas in 1899. I may say that great care has been exercised in keeping the accounts, both for labour and material, entirely separate from those dealing with coal gas manufacture, &c.; and this has been rendered practicable by the fact that our two plants are absolutely distinct up to the point where the gases unite at the mixing cylinder prior to entering the holders.

Carburetted water gas produced = 211,189,000 cubic feet.
Average illuminating power, 19·90 candles.

Cost of production :—

	£	d.		
Coke at 17s. per ton	2,970	or 3·261	per 1000 cubic feet.	
Breeze at 7s.	269	,, ·306	,,	,,
Oil at 2¾d. per gallon	6,685	,, 7·597	,,	,,
Manufacture	1,278	,, 1·453	,,	,,
Purification	862	,, ·980	,,	,,
Wear and tear	620	,, ·710	,,	,,
Water	176	,, ·200	,,	,,
Salaries	571	,, ·650	,,	,,
		15·157		
Credit Tar sold, £87 = 0·098d.				
,, Breeze ,, £199 = 0·227d.				
		·325		
Net cost per 1000 cubic feet = 14·832				

The above figures show, therefore, that to manufacture 1000 cubic feet of carburetted water gas of an average illuminating power of 19·90 candles cost 14·83d., or only 0·73d. more than the cost of manufacturing 15·01-candle power coal gas in 1897. The increase in illuminating power was thus equal to 4·90 candles. But as only 30 per cent. of the carburetted water gas was required to produce a mixed gas of an illuminating power of 16·15 candles, or an increase of 1·14 candles, it follows that the cost per candle for enrichment would be 0·73d. ÷ 3 ÷ 1·14 = 0·21d. per 1000 cubic feet.

It will be noticed that I have taken the enrichment as equal to 1·14 candles, although in reality it was 1·75 candles, as the average illuminating power of the coal gas produced was only 14·40 candles. As, however, I have taken the cost of manufacturing 15·01-candle power coal gas in my calculations, and as I have no figures to show the actual cost of manufacturing gas from north-country coal without any enrichment whatever, I have estimated the extra enrichment to have been 1·14 candles.

I have already stated my belief that the decrease in the production of coke must have a beneficial effect on its price. This is, however, a contention not easy to prove by figures; and I have therefore charged the coke used in manufacture at the average price realized throughout the year. There are many advantages arising from the use of carburetted water gas which it is needless for me to mention, as they have been brought before you so frequently. I should, however, like to draw attention to the facilities carburetted water-gas plant affords to an engineer for working his coal-gas plant to the best possible advantage, more especially with regard to letting down and starting of retorts, and keeping them under slow fire. This is, of course, an advantage to which it is not easy to assign a definite pecuniary value. I may, however, state that in 1897 we let down and started retorts on 37 occasions; while in 1898 and 1899 the figures were 21 and 18 respectively. This must, I think, represent some appreciable

saving in coke and labour, as well as in wear and tear on the retorts themselves.

Having now placed before you some of the advantages of the use of water gas, I think, to be perfectly fair in the matter, I ought to mention one or two points, in which carburetted water gas fails to compare favourably with coal gas. I have during the past year made a great number of experiments on the comparative calorific values of coal gas, pure water gas, and the mixture of the two, and also upon the illuminating values of each consumed in burners other than the standard argand; and I am bound to confess that my results are not quite as favourable to carburetted water gas as my thorough belief in its general merits would lead me to desire.

I do not intend to give my results in detail, especially as this will probably be done, at any rate in the case of calorific value, in a paper which is to be brought before us during our proceedings. I will therefore content myself by giving a few general results at which I have arrived.

In testing for calorific power, I have used the Dowson calorimeter, and I give the results (after allowing for condensed water) in British thermal units. It is somewhat difficult to make comparisons in a manner which shall be perfectly just to carburetted water gas. Using as we do ordinary Durham coal, and producing from it (say) 10,700 cubic feet of gas per ton, it is hardly practicable to obtain a gas of a higher average illuminating power than 14½ candles. On the other hand, in order to obtain the requisite enrichment, we usually manufacture carburetted water gas of about 20 candles. Apparently, therefore, the only way to make a comparison between the calorific powers of the two is to calculate the number of British thermal units represented by 1 candle of illuminating power in each case; and my experiments lead me to believe that this method is not quite fair to the carburetted water gas. I find that as the illuminating power of the coal gas is lowered, the higher will be the results obtained in British thermal units per candle; while the units per candle in the case of carburetted water gas will be lowered as the illuminating power is raised. For instance, when comparing coal gas of an illuminating power of 14·06 candles with carburetted water gas of 23 candles, the comparison is as 40·6 British thermal units per candle is to 26·6 British thermal units—a difference of 35 per cent.; while when 15·76-candle power coal gas was compared with 18·70-candle carburetted water gas, the former gave 36·8 units per candle, and the latter 31·5 units—a difference only of a little over 14 per cent. Had I been in a position, after appreciating this point, to compare the gases under conditions more equal as to illuminating power, I feel sure the difference between their calorific values would have been still further reduced.

With regard to the illuminating power available from coal and carburetted water gas, or from the two mixed, when consumed in burners other than the standard argand, I have made a number of experiments of which a short *résumé* may be of interest. The burners used were as under—

Sugg's governor burners 4 ft., 5 ft., and 6 ft.
Goodson's 5 ft. governor burner.
Hawkins and Barton's governor burners 5 ft. and 4 ft.
Bray's 6 ft. special.

The comparison I have adopted is somewhat similar to that used in the previous set of tests—*i.e.*, I have compared the value of the above burners with 1 candle as obtained in the argand burner. For instance, supposing the argand gave an illuminating power of 15 candles, and the Sugg's governor burner 10 candles, the value of the latter would be represented by the figure 0·66 of a candle. I found that with coal gas the value varied from 0·81 of a candle to 0·60; the former value being given with a 6 ft. burner, and the latter with one governed to pass 4 ft. only. The average of my results was 0·74 of a candle. With mixed gas (the amount of carburetted water gas being about 30 per cent.), the results varied from 0·73 to 0·68; the average being 0·71. With carburetted water gas, the values varied from 0·72 to 0·59; the average being 0·66 of a candle.

The conclusions to which these results point, therefore, are—

1.—That a mixture of 30 per cent. carburetted water gas and 70 per cent. coal gas gives a result, when burned in the above-mentioned ordinary burners, averaging about 4 per cent. less than that obtained from coal gas alone.

2.—That carburetted water gas (of an illuminating power varying between 17 and 20 candles) gives a value averaging over 10 per cent. less than those obtained from coal gas consumed in similar ordinary burners.

As I have already said, my results are not as favourable as I should have liked to have seen them; still I am confident that, after taking them into careful account, the balance of advantage undoubtedly remains on the side of carburetted water gas. It should be, I believe, possible to produce a burner of the ordinary type, whereby the illuminating power obtained from the mixed gas—which, of course, is the important point—may be considerably improved; and with regard to calorific values, I am inclined to the belief that the higher flame temperature of the carburetted water gas makes up to some extent for a portion of its deficiency in this respect.

I approach with some diffidence the question of the effect which carburetted water gas has on naphthalene deposits. I believe it has been stated by some that the use of this gas has almost entirely done away with the trouble from this cause. I am bound to admit, however, that my experience does not bear out this statement. I do not mean to say that carburetted water gas has no effect whatever on the amount of naphthalene deposited; but I fear I cannot say that our total number of complaints caused by stopped service-pipes has been less during the past two years than it was formerly.

It must, I think, be admitted, however, that complaints received during the winter months are more difficult to deal with than those which engage attention during the summer season; and since we commenced to use carburetted water gas, it is very certain that, while the trouble in summer has shown an increase, our winter difficulties have declined to a most appreciable extent. To deal thoroughly with this question would require more time than I have at my disposal—even if I were to devote to it the whole of my address. I feel, however, that the matter is of so much importance that I should fail in my duty if I were not to give to it something more than a passing allusion.

The naphthalene difficulty has, I believe, been an ever-present one with us in Croydon; and looking at the manner in which stopped pipes are usually dealt with, it is somewhat of a mystery to me why the whole of the mains and services are not absolutely blocked with accumulated deposits. The only possible explanation is that under certain conditions gas has the power of picking up and carrying to the burners for consumption certain quantities of naphthalene previously deposited. The chemical aspect of the question has been, and still is, engaging the attention of more than one experienced chemist, and lately we have been somewhat startled by the theory that it is possible for naphthalene to be produced in the distributing system from gas which entered the mains and services practically free from it; the principal evidence adduced in favour of this theory being apparently the inability of its author to throw down from the gas as it enters the mains anything like a sufficient quantity of naphthalene to account for the deposits afterwards encountered. I think we shall require evidence of a very much stronger character before this theory can be credited. The author also expressed an opinion that variations in temperature have but little effect on the deposition of naphthalene. Well, I do not mean to attempt a theoretical dissertation on this subject; but I must say that the experience I have gained of late years strengthens me in my belief that, given a gas so produced as to contain naphthalene, the deposition of the latter in the mains is almost entirely a question of change of temperature—that is, of course, assuming that no previous steps have been taken to remove it.

In proof of my contention, may I ask your consideration for a few moments of the conditions existing at Croydon. Our experience leaves little doubt in my mind that the gas as we produce it does contain sufficient naphthalene to generally saturate it at the particular temperature at which it enters the holders. The total quantity to do this may be but small; and I believe that gas which contains but a few grains per 100 cubic feet is capable of depositing naphthalene in the mains when subjected to a considerable reduction in temperature.

This question of saturation is, of course, dependent on certain chemical laws; and it is, I believe, being carefully considered in more than one quarter at the present time. Now, although I am not absolutely certain on the point, I

firmly believe the carburetted water gas made at Croydon is practically free from naphthalene. I have, however, no stronger evidence in favour of this belief than the fact that the tar produced in the manufacture, when carefully tested by a chemical expert, was found to contain no measurable trace of this hydrocarbon. Assuming, therefore, that carburetted water gas is being used to the extent of 30 per cent., the mixture entering the holders is composed of this proportion of a gas free from naphthalene, and 70 per cent. of coal gas containing just as much naphthalene as it can hold at the particular temperature which exists. The result is (especially as the carburetted water gas is generally of a higher temperature than the coal gas) that the mixture becomes under-saturated. It then enters the holders; and should this take place in summer, it is exposed to the heat of the sun, under which conditions its degree of saturation is further reduced. My contention, therefore, is that, in leaving the holders, the gas exists in a condition in which it may be assumed to be capable of picking up old naphthalene deposits, until it may become saturated; and as it cools in traveiling through the underground system, the naphthalene is again deposited—the result being, as I have before stated, that our troubles from this cause are considerably greater in summer than in the winter months.

I think further evidence in support of this statement is found in the fact that since our adoption of carburetted water gas the inlets and outlets of our holders, which previously were constantly becoming stopped, have given no such trouble; and on examining them quite recently, I found them practically free from deposits. In winter, the conditions are reversed. Both the coal and oil gases are colder on entering the holders; and as these during the winter months are probably the coldest portions of our plant, it is quite possible that in their interiors some portion of the naphthalene may be deposited. On entering the mains, it is highly probable that the temperature to which the gas is subjected is higher than that which existed in the holders themselves. It is therefore more likely that old deposits of naphthalene should be picked up, than that new ones should be thrown down; and I think this idea is supported by the fact that at such times the illuminating power of the gas at Croydon suffers no reduction in travelling from the works to our testing-station nearly two miles distant. Indeed, it is true, although I make the statement with a certain amount of diffidence, that during the year ending Dec. 31 last, the average illuminating power of the gas as tested at the works was 16·10 candles, while at our town testing-station it was 16·15 candles.

In dealing with the question of naphthalene, it seems to me there are two or three courses open: Either to manufacture the gas (as appears quite possible) so that it shall not contain sufficient naphthalene to cause solid deposits under the varying conditions to which it may be subjected; to so produce it that any naphthalene it may contain shall be deposited simultaneously with the deposition in a liquid form of some other solvent hydrocarbon of similar vapour tension, and so avoid the solid formation; or, in the event of the gas containing enough naphthalene to cause trouble, to remove this on the works by passing it through some suitable solvent, or to deal with it in the mains by some such process as that known as the Hastings carburation process, which I contend is simply a form of washing under another name, but which has this advantage that not only is it less expensive than the process of washing on the works in the matter of solvent used, but it removes less of the illuminating qualities of the gas, as it is only necessary to use sufficient oil to remove that proportion of the naphthalene which would otherwise be deposited under the varying conditions in the mains. I had hoped to be in a position to give you my personal experience of this process; but circumstances unfortunately prevented my being able to get the apparatus into use as early as I expected.

As I previously said, it is not my desire to enter deeply into the strictly theoretical side of this vexed question, but rather, by stating facts which have come under my notice, to render some assistance to those more able than I, who are engaged in the investigation of the subject from a purely chemical standpoint; and it is with this object in view that I venture to give you some particulars relative to the deposition of naphthalene in my own district as compared with that of one of my neighbours—I allude to the town of Redhill—where naphthalene has apparently never shown itself in any shape or form, while, as I have before said, in Croydon it forms the source of one of our principal difficulties. In both these towns, practically the same descriptions of coal are used. Regenerative settings and fairly high heats are common to both works, although in Croydon the make per ton is somewhat higher than at Redhill, while at the former place manual stoking machinery is partly used.

The principal difference in the treatment of the gas commences after it leaves the retorts. At Croydon, steps are taken to remove the tar from the hydraulic, and to keep the gas separate from the tar as much as possible, annular condensers being also used. At Redhill, however, a tar-seal is used in the hydraulic; while the gas and the tar travel together through a long length of foul-gas main, which forms the only condenser. On carefully considering the matter, I came to the conclusion that the principal reason for the absence of naphthalene in the Redhill gas was to be found in the fact that this hydrocarbon was abstracted from the gas by the tar as they travelled together in the foul-gas main; and I assumed that if this were the case, it would be only natural to expect that the Redhill tar would contain a larger percentage of naphthalene than would be found in that produced at Croydon. I therefore had samples from both works carefully tested, and, somewhat to my surprise, the results showed that while the tar from the former works contained 5·7 per cent. of naphthalene, that from the latter contained 8·5 per cent.

These tests were only made during the last few days, and I have had no time to carry the investigation further. But the slight consideration I have been able to give to the matter since, seems to point to the probability that the freedom from deposits in the former district is rather due to the fact that the mode of manufacture results in a gas being produced containing so little naphthalene that no difficulty is experienced with it afterwards, than to the absorption of naphthalene being effected by the treatment to which the gas is afterwards exposed.

In connection with the purification of carburetted water gas, some difference of opinion, I believe, exists as to the relative advantages of the use of oxide of iron and lime; and although views on this subject must be considerably modified through the great rise in the price of oil, I still venture to give some particulars of experiments I have made on the question.

The average of a very considerable number of tests shows that the amount of carbonic acid present in carburetted water gas as it enters the purifiers is about 3·8 per cent.; while sulphuretted hydrogen exists to the extent of from 200 to 250 grains per 100 cubic feet, with about 5 to 7 grains of sulphur compounds. To ascertain the loss of illuminating power due to the presence of carbonic acid, I have made numerous experiments by testing the gas for carbonic acid before and after its passage through the oxide purifier, and again at the outlet of the lime purifier; the illuminating powers of the gas being also carefully recorded. The average results are shown in the following table:—

Illuminating Power.		Difference.	Carbonic Acid.		Difference.
After Oxide.	After Oxide and Lime.		Before Oxide.	After Oxide.	
14·58	18·24	3·66	4·08 p. ct.	3·85 p. ct.	0·23 p. ct.

Difference = 0·98 of a candle for 1 per cent. of carbonic acid.

The above figures show that the loss due to 1 per cent. of carbonic acid is higher than is usually estimated. But they are the results of a long series of experiments; and I give them for what they are worth. It will also be noticed that the oxide of iron apparently absorbs an average of about 0·23 per cent. of carbonic acid—a somewhat strange result, and one which I will not attempt to explain beyond saying that it may be possible that the presence of sulphuretted hydrogen in the gas at the inlet to the oxide purifier may have had some influence on the tests.

Now, taking the value of a gallon of oil at 7 candles per 1000 cubic feet, to make up for 3½ candles loss due to the presence of carbonic acid, an extra half-gallon of oil must be used, the value of which, at 3d. per gallon, is 1·50d. From this amount must be deducted the value of the extra

volume due to the presence of carbonic acid (say) 0·56d.; and if an addition of 0·10d. be made to cover the cost of oxide purification, a figure of 1·04d. is obtained, to compare with the 0·98d. which I have stated to be the cost of purification by lime in Croydon. It would therefore appear that, even with oil at 3d. per gallon, the advantage rests with the process which effects the abstraction of carbonic acid. I am of opinion that lime in (say) four boxes of ample size, and oxide in a final catch-box, forms a most economical combination; the objection to it being that at times the oxide fails to act on the small traces of sulphuretted hydrogen with which it has to deal, and unfortunately the use of Weldon Mud (of the action of which in connection with the removal of the last traces of sulphuretted hydrogen in coal gas I cannot speak too highly) is impossible under the conditions, as at times it would be liable to receive carbonic acid.

Earlier in my address, I stated that, in addition to his endeavour to cheapen the cost of production, the engineer should do his utmost to popularize the use of gas. Now there is little doubt that what is known as the prepayment system has given to gas engineers a ready means of fulfilling this latter requirement. I hope, therefore, I may be excused if, before concluding, I give a few facts and figures relative to its working in the Croydon district.

The supply of gas on the prepayment principle was adopted in 1889. Under this system, houses are provided with the necessary fittings, including a meter whereby the inspector, by means of a special key, is able to secure to the consumer a certain quantity of gas for which he pays in advance—a weekly rent of 2d. or 3d. being charged according to the fittings supplied. In 1894, my Company took over the outlying districts of Carshalton, &c. Here it was decided to make a trial of the penny-in-the-slot system; and we have therefore had an opportunity of comparing the merits of both principles.

I am afraid that gas companies are rather inclined to base their estimates of the success of prepayment systems upon the usually rapid increase in the number of those adopting them, and to neglect the consideration of the main question—viz., whether the venture is a really paying one at the prices charged, *especially when compared with the terms offered to ordinary consumers.*

At the end of last year, the Croydon Company had 14,604 meters in use, 4539 of which were on the prepayment, and 379 on the automatic principle. The average consumptions per consumer were as under.

Ordinary	61,000 cubic feet.
Prepayment	18,600 ,, ,,
Automatic	15,800 ,, ,,
Average	47,000 ,, ,,

In 1889, the average consumption per consumer was 61,000 cubic feet; so that, notwithstanding the fact that the number of stoves on hire had increased from 1080 to 6200 at the end of 1899, the consumption per consumer had been decreased to 47,000 cubic feet, which, of course, points to the probability of the cost of distribution having considerably increased.

The following table shows the capital expended under the various systems, also the amounts received for gas and rental of meter, fittings, &c., and the percentage on the total represented by such rental. I should say that service-pipes are not included in these figures,

	Amount received for Gas.	For Rental.	To'al Expenditure.	Percentage of Rental on Outlay.
Ordinary	£67,935 2 0	£3,593 10 0	£37,410 4 0	9·60
Prepayment	8,985 14 0	2,394 14 0	19,412 11 3	12·33
Automatic	759 11 0	166 17 0	2,036 7 1	8 20

The average amounts expended on the several classes of consumers are as under.

Ordinary	£2 18 5
Prepayment	4 9 9
Automatic	7 8 5 (including cooking-stove)

The charge for gas in Croydon is at the rate of 2s. 8d. per 1000 cubic feet, and in the Carshalton district 3s. 5d., with an additional 9d. per 1000 cubic feet for rent of fittings, &c., where automatic meters are used.

Now the actual cost of dealing with the three systems has been accurately kept; and the following table will, I think, supply definite information as to the conditions under which the various consumers are paying for the gas supplied.

	Ordinary. s. d.	Prepayment. s. d.	Automatic. s. d.
Gross amount received per 1000 cubic feet, inclusive of rents, &c.	2 9·60	3 2·54	4 2·00
Cost of collection, inspection, bad debts, 10 per cent. depreciation, &c.	2·28	8·79	1 2·15
	2 7·32	2 5·75	2 11·85
Price of gas	2 8·00	2 8·00	3 5·00
	0·68	2·25	5·15

It will thus be seen that, while the automatic and prepayment consumers are being supplied with gas at 5·15d. and 2·25d. per 1000 cubic feet respectively under the selling price, the ordinary consumer is paying within 0·68d. of the full amount. In these calculations the principal charges are for depreciation, &c.; and this is apparently unduly large in the case of the automatic system. The reason for this is that the cost of the stove must be included in the outlay, while no extra rent can be charged; for it would be manifestly unfair to levy a rent for a piece of apparatus which leads to an increased consumption of gas, upon each 1000 cubic feet of which an extra charge is made to meet the added expenditure.

It is true that in Carshalton the consumers do not live so closely together as is the case in Croydon; and this may somewhat increase the expenses attending the working of the former system. It is nevertheless a little surprising to find that the cost of collection, inspection, and office expenses in the case of the automatic system is 3·03d. per 1000 cubic feet, as against 2·89d. with the prepayment meters. In the case of the former, the collector and assistant can only make 300 visits weekly; while with the latter one inspector attends to 700 consumers each week. It would appear, therefore, from the above figures that the prepayment system is really cheaper to work than is the automatic; and that it has many advantages over the last named, our experiences in Croydon undoubtedly prove. There are two objections which will probably be raised against the Croydon system; the first being that there is a danger of a consumer being left without gas at an inopportune moment, and secondly that a consumer may not always be prepared to pay the amount demanded for the gas he requires.

I must confess that the first objection does constitute a difficulty. Still, I can safely say that such occurrences are far rarer than might be supposed; while with regard to the second, I can only say that I rarely, if ever, hear of an instance in which the objection is raised.

On the other hand, prepayment meters work so accurately that it is never found necessary to make any adjustment between the amount of gas consumed and paid for, and that registered by the ordinary index. This can scarcely be said with the penny-in-the-slot meters. The discrepancies which arise are somewhat delicate to deal with; and the fact that they do occur renders it almost impossible to keep a satisfactory check on the collectors.

Further, I should like to point out that there is a manifest injustice to large consumers burning gas under the automatic system; and in proof of this I give below examples of two typical cases taken at random from my Company's books. "A" is a customer supplied with a 5-light meter and a cooking-stove, which cost, with fixing, £5 13s. 7d.; while "B" has a 3-light meter and a cooking-stove which cost £2 1s. 9d., fixed.

"A"—Total expenditure for meter, house-fittings, cooking-stove, and fixing			£9 2 9
Amount received for gas supplied, rent, &c.—viz., 59,300 cubic feet at 4s. 2d. per 1000 cubic feet		£12 7 1·00	
Less for gas only do. at 3s. 5d. per 1000 cubic feet		10 2 7·00	
Difference available for rent, depreciation, &c.		£2 4 6·00	
Deduct—			
Cost of collection, inspection, and clerks	14s. 11·67d.		
10 per cent. depreciation	18 3·30		
		£1 13 2·97	
Balance, being extra profit		£0 11 3·03	
"B"—Total expenditure for meter, house-fittings, cooking-stoves, and fixing			£5 17 4
Amount received for gas supplied, &c., 8400 cubic feet at 4s. 2d. per 1000 cubic feet		£1 15 0·00	
Less for gas only do. at 3s. 5d. per 1000 cubic feet		1 8 8·00	
		£0 6 4·00	
Deduct—			
Cost of collection, &c.	2s. 1·45d.		
10 per cent. depreciation	11 4·00		
		£0 13 5·45	
Difference, being loss		£0 7 1·45	

In the foregoing calculations, the charge for collection, &c., is based on the average cost per 1000 cubic feet; but if the amount per consumer were substituted—viz., 3s. 6d. (which would perhaps be quite fair, inasmuch as it costs just as much under this head, whether the amount of gas consumed be large or small), the disparity between the two cases would be much more marked.

Gentlemen, I have, I fear, trespassed far too long on your time and patience. If so, let me ask your forgiveness, and also your acceptance of my sincere thanks for the kind attention you have given to my remarks.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1138.)

LAST week brought no improvement into the state of business in the Stock Exchange. There was an utter absence of all animation. There was as little inclination to solidly invest as to speculate; and the order of the day seemed to be to do nothing. People appeared to want some event to stir them, and nothing came; and the tightness of the Money Market tended to repress exuberance. The settlement engaged attention, but even that was light. And before the week was over, the attendance had begun to diminish; for to-day is a holiday on the Exchange, and with it in view some thought that, if they could not do any work, they might as well go away and play. Prices, of course, are lower all round, though there was no drop of any considerable magnitude. The Money Market, which had been looking a little easier at the close of the preceding week, began to harden at once, and rates all through the week held up stiff. There does not seem to be very much prospect of any relaxation just at the present time. Business in the Gas Market was quite as quiet as in any other department; and there was not much by way of incident to record in it. Perhaps the chief feature was that changes in quotation were both few and slight. Although the temporary reduction in the coming dividends imposed on Gas Companies by the exorbitant prices demanded for coal is now getting more generally understood, shareholders are not betraying any weakness, and sacrificing their holdings. Among the Metropolitan Companies, Gaslight ordinary opened at 102¼, and gradually eased down to 101; but the quotation was left standing. Little was done in the secured issues; but the preference had to recede slightly. South Metropolitan changed hands once at 132; but the final mark was 128½. The stock, however, was standing at such a high figure that it was susceptible of some reduction in reason. Commercials were not touched. There were only two or three transactions in the Suburban and Provincial group; and they gave no indication. Quotations did not move. The Continental Companies were no busier than the others; and they, too, had a moderate fall, which affected Imperial, European, and Cagliari. The remoter undertakings were also among the losers; Monte Video and Cape Town being lower. Only moderate business was done in Water at about middle prices. There was no tendency either way; and quotations were left undisturbed.

The operations were extremely limited all through the week; and it will suffice to note the daily changes of quotation. On Monday, South Metropolitan fell ½. On Tuesday, Imperial Continental and Cagliari receded 1, and European part paid ½. On Wednesday, South Metropolitan moved back 1, and Cape Town and Monte Video ½. On Thursday, South Metropolitan fell ½. On Friday, Gaslight preference relapsed 1½. On Saturday, South Metropolitan ½.

ELECTRIC LIGHTING MEMORANDA.

Another "James Forrest" Lecture—Sir F. Bramwell's Opinion of the Electric Lighting Acts—Cases of "Force Majeure."

THE "James Forrest" Memorial Lecture at the Institution of Civil Engineers was entrusted this year to Sir W. H. Preece, whose subject was "The Relations between Electricity and Engineering"—a very good subject, too. It is the more to be regretted that the lecture remains to be delivered; for the discourse that got itself spoken on this occasion was no exposition of the subject. Sir W. Preece, of course, is a very clever man, and a fortunate; or he would not be where he is to-day. But as a lecturer, or a maker of a presidential address, he never seems to be quite sure whether he is holding forth to an infant school, or speaking to men who know his and their business so well as to desire to know it better. There are many points of contact between electrical science and engineering which both electricians and engineers, and the busy, anxious world behind them, want to have defined and criticized. Meanwhile, even the "Electrician" is fain to offer an excuse for Sir W. Preece's display of "childishly simple" experiments. It is that his "audience was composed mainly of civil engineers—men who, perhaps, had spent all their long lives in building docks and canals, and who hitherto had missed every opportunity of seeing a magnetized poker pick up iron nails." This is how the authorized abstract report makes the eminent lecturer speak of electric lighting: "An electric glow lamp does not vitiate the air. It does not throw into circulation in the air any product of combustion. The question of ventilation is very much reduced in importance and rendered more simple in effect." Prodigious, indeed!

It is not to be wondered at that after more than an hour of this stream of ponderous platitude, Sir Frederick Bramwell, who must have been boiling over with the desire to pitch into somebody or something, by way of relieving his over-charged nerves, took the opportunity offered by seconding the formal vote of thanks to the lecturer for making a lively onslaught on the Electric Lighting Acts of his native land. The "Electrician" describes Sir F. Bramwell's as a "smart little speech" which made amends for much of the antecedent boredom. Sir Frederick could not be dull if he tried. Whatever else he may be, he is one of the most humorous of mankind. In the circumstances, it would be unfair to take his impeachment of the Electric Lighting Acts too seriously. At the same time, it would be an absurdity to side with Sir W. Preece, who flatly contradicted his professional brother on the point, declaring that Sir Frederick was utterly wrong, and that no better Act than the Electric Lighting Act of 1882 was ever passed. We quote always from the "Electrician." It passes comprehension that an engineer can justify an experiment in legislation which had a purely negative effect until it was amended six years later. From some standpoints, the operation of the first Act as a brake upon electrical speculation may be approved; but it cannot by any stretch of charity be credited with having encouraged electrical enterprise in any way. It has doubtless protected some interests; but electricians have never ceased to chafe under its restrictions.

Some interesting police-court proceedings took place last week in London, in connection with the charges against several of the Metropolitan Electricity Supply Companies for making default in carrying out their statutory obligations to their customers. The Metropolitan Company had to answer six summonses in regard to Marylebone. The cases had stood adjourned for three months, after the Company pleaded guilty and submitted to the judgment of the Court, to see how matters would go. During the interval, there have been fourteen failures of the service; but these were all explained to the satisfaction of the Magistrate, who remarked that the explanation offered exculpated the Company. On the original summonses, however, to which the Company pleaded guilty, he condemned them to pay 5s. for every time (total £1 5s.) with ten guineas costs. At Greenwich, seven summonses were heard against the London Electric Supply Corporation for failure to supply a Deptford public-house. The facts were admitted; but the Company pleaded unavoidable accident, or *force majeure*, by way of extenuation or excuse. The difficulty had been the partial failure of the coal supply. The case stands over for decision on the 4th inst. At the Southwark Court, the same defendants had to meet a similar charge, and offered the same defence, which prevailed. The Magistrate, Mr. Paul Taylor, decided that the Company's default was covered by the term *force majeure*. Failure to procure the necessary fuel is not negligence, neither is inability to foresee the circumstance that new boilers on order will not be delivered in due time. The summonses were dismissed.

The salient feature of the proceedings is the introduction for the first time in such circumstances of the plea of *force majeure*. As was noticed in one of the cases, this term is new to English statute law, and requires interpretation. One Counsel said it means the same thing as *actus Dei*; but it was very reasonably observed that it covers more than this. Mr. Paul Taylor, as we have seen, reads it rather broadly; and he is doubtless right in so doing. For if those who introduced the term did not mean it to cover more than the older form of words "act of God," they would have contented themselves with the more familiar expression. To say sooth, it would be a good thing if the bad old Latin term were to be dropped altogether. It is distinctly impious, inasmuch as it throws upon the Deity the entire responsibility for every untoward and mischievous catastrophe, and assumes that the same Power has nothing to do with things when they go right. *Force majeure*, however, is foreign language; and we ought therefore to leave it to the international jurists. It has become the practice of late in the drafting of Gas Acts to insert a clause protecting the undertakers against frivolous prosecutions, and also exempting them from penalties for defaults which are referable to any cause which is held by the Court having cognisance of the case to be beyond their control. This provision is adequate to the real requirements of the undertakers of a statutory supply undertaking, which are merely that they shall not be held liable to perform impossibilities. The fewer new puzzles that are set before the Courts the better. It is against the whole spirit of English law to define general words. We do not like *actus Dei*, nor *force majeure*. "Unavoidable cause" is English; and is sound, good sense as well.

The Council of the Chemical Society have decided to commemorate the services rendered by the late Sir Edward Frankland by requesting his "pupil, collaborator, and friend," Professor Armstrong, to give in the ensuing autumn a memorial lecture on his life-work.

PATENT LAW REFORMS—HINTS ON SPECIFICATION DRAFTING.

SEVERAL expressions of appreciation of our article of the 17th ult., entitled "Suggestions for Patent Law Reform," having reached us (some accompanied with observations on the debateable points of the matter), it will be convenient to dispose of the subject for the time being by publicly acknowledging these contributions to the discussion. Our attention has been directed to a leading article that appeared in "Engineering" on Jan. 12 last, in which very similar opinions to our own were expressed as to the questionableness of turning the Patent Office into an Informations-Bureau. This article went very thoroughly into other considerations bearing upon the general proposition that Government ought to help the would-be patentee more than the Patent Office is allowed to do at present; and it is a pity that Mr. Levinstein before he spoke on the subject at Manchester did not take to heart some of the thoughtful passages of the article. With regard to the helping of poor inventors to get patents, it is pointed out that the Patent Act of 1883 went a long way in this direction, by providing for the transmission of applications by post, by the sale of stamped forms at post offices, and by offering other facilities to the applicant who is his own patent agent. Our contemporary supports the "JOURNAL" testimony to the faithfulness with which the staff of the Patent Office, high and low, have laboured to give the fullest effect to the provisions of the law. Nevertheless, it is remarked that there is no proof that all this has proved an unmitigated blessing to those in whose behalf it is supposed to have been intended.

This expression of our contemporary's is rather high-pitched. Nobody expects unmitigated blessings to flow in upon him from any source—least of all from a Government department. Inventors perhaps are more exacting in this way than other people; but even they ought to be content with a reasonable balance of advantages over drawbacks. It is asserted, however, that this condition is not realized under the present system. Too great laxity in the drafting of the provisional specification is said to be allowed—out of mistaken kindness to the applicant. It is unquestionably true that the facility and cheapness of the procedure for obtaining provisional protection lead to much waste of time, trouble, and money at the instigation of ignorant and unskilful applicants who really have no invention at all. It is difficult, to the point of impossibility, for any Examiner or Controller to do strict justice to many of these applicants; and so, in the end, injustice is done to them, to the system, and to the public.

This reflection recalls the advice lately given by the "Engineer" on the subject of the drafting of patent specifications. It is a great mistake—although many people commit it every day who should know better—to believe that anything will do for a provisional specification. This blunder arises partly out of the erroneous belief that there will be ample opportunity for putting matters to rights in the complete specification. But its main source, we venture to think, lies in the deplorable lack of thoroughness, of "grounding," in the superficially-schooled people of these times. Take the "Engineering," and the "Engineer" catalogues of some common applicants' errors: Failure of the provisional specification to describe the nature of the invention; failure of the title to sufficiently indicate the subject-matter; hopeless incapacity on the part of the author of the document to express his ideas in writing; wrong spelling; incorrect placing of marks and stops; various spelling of technical words and scientific names; leaving out of important words from a sentence; attempts at scientific or legal phraseology vitiated by ignorance both of the language and of the subject-matter. Most of these failings are due to different degrees of ignorance, and the rest to that kind of carelessness which is only ignorance in another guise. Many people start a-patenting on their own account without having the smallest notion of what constitutes a clear, intelligible, complete definition. Consequently they are completely at a loss even for a title for what they fondly imagine to be their "invention." They need a friend to surprise them with the sudden query, "What are you doing there?" Then they might reply, without thinking twice, "I am making a new gas-burner," or whatever it might be. This gives the title of the invention. But for ten men who could "give it a name" straight off, nine would be sorely puzzled to solemnly assign a "title" to their invention at the head of a Patent Office form.

Similarly with the drafting of the provisional specification. The idea of this is really that of writing a letter to a friend telling him in ordinary language what one has been working at of late. So easy to prescribe, so hard to get done! Of course, the first essential is to know one's self what one has been doing, with what means, and to what purpose. In the old-fashioned style of schooling, which admittedly ran overmuch to grammatical studies, when it was not overdone a boy at least learnt the nature of a sentence, or "saying." If he attained to the perception that the sentence is the unit of intelligible language his necessary grammatical instruction was complete. If he remained in the state of ignorance that tacitly holds the single word to constitute the unit of speech or writing, he would always be exposed to the risk of failing to speak or to write intelligibly. This imperfect state is now the general one for those who have passed through modern elementary schools. They can hardly spell common words, and their carelessness on the point is such that they will not take the trouble to see that they spell technical or scientific terms accurately and consistently. Wrong punctuation comes from ignorance of the construction of the sentence. Obscure, laboured, unintelligible diction is due to the same ignorance, coupled with want of thought about the proper meaning of the words used. On general principles it might be imagined, with some plausibility, that people engaged in technical work, or endowed with a taste for science and of an inventive turn of mind, would know the proper use of their own special "lingo." But this is far from being the case.

The "Engineer" cites an example in point. "The lightest coal-tar hydrocarbon is peculiarly liable to ill-treatment. We read in different patents of 'benzene,' 'benzine,' 'benzole,' 'benzoline,' and 'benzin.' Sometimes two or three forms occur in one specification. According to the best chemical practice, 'benzin' is extinct; 'benzine' means a light spirit obtained from crude petroleum, and is quite different from 'benzene,' which is $C_6 H_6$. 'Benzol' and 'benzole' are trade names for 'benzene;' but they usually convey the idea of a less highly rectified spirit unless they are preceded by the adjective 'pure.'" This is a very good lesson indeed. Again: "Confusion often arises in the incorrect employment of technical words in other branches of science. We have noted 'segment' instead of 'sector,' 'spiral' instead of 'volute,' or *vice versâ*. Even 'cocks' and 'valves' borrow one another's names." If specification writers knew that, in the trial of patent cases, there is often great use made of dictionaries, they would take care to have respectable authority for the meanings they attach to important words. The advice should not be thrown away upon writers of technical papers in general.

It is possible to agree with the "Engineer," that "punctuation is a purely esoteric art, capable of mastery only by compositors and readers—and they seldom agree on the rules," while still holding that its intelligible practice should have no terrors for persons who know the construction of sentences. We do emphatically agree, moreover, with the observation that punctuation, if it is done at all, ought to be done according to the conventions of the printers, and not after the vagaries of an amateur scribe. Another pitfall of the specification-writer is the plenitude of conventional "tags" which he is sure to find in use by others, and to copy for himself. These consist of such phrases as "with or without some other ingredients," or "the like," or "otherwise substantially as described." It is safe to say that few of the writers who employ these phrases know how the Courts understand them. To these innocents, it may not be amiss to remark that the Courts conform to a principle of interpreting words in certain connections which is called the rule of "*ejusdem generis*." This means that general words following words of particular description of the application, are limited to the things described and their analogues and equivalents. Thus, if a man is describing what to do in manufacturing a brick, and he uses the term "&c." in this connection, this will not be construed as covering everything else, but only things partaking of the character of a brick. This is worth knowing.

Returning to the subject of patent-law reform, we are reminded that the question of official searches for novelty has been mooted for many years. We are also asked to correct Mr. Levinstein's reported statement that the Institute of Patent Agents discredit the general idea of an official search for anticipations. What the Institute—in agreement with most persons of experience—do condemn is the German and United States systems of Patent Office procedure. In connection with this subject, we believe that Mr. W. Lloyd Wise is going to make a suggestion at the coming Paris Congress on International Patent Right. This eminent authority, who has been a devoted worker in the field for a quarter of a century, objects equally to the issue of Letters Patent at applicant's own risk, and to preliminary official examination with power of refusal of protection. What he recommends is preliminary official examination for novelty, but not for utility—the applicant's attention to be expressly drawn to any prior publications which seem to at all bear on his claims. Then, if the applicant still elects to proceed, he should not be debarred from doing so, subject to mention of the prior matter. Such is Mr. Lloyd Wise's compromise, which seems perfectly simple and fair. It is debateable, however, whether an applicant for provisional protection has any claim whatever to be told his business at the national cost. In no other department of commercial enterprise is the adventurer so helped at the public charge. If a man brings out a play, or a novel, which is open to the imputation of plagiarism, he has to "stand the racket," however innocent he may be; and it is difficult to see why an author should be worse served than a would-be patentee. It is not even proposed to assist the ingenious designer of trade-marks to avoid the unpleasant consequences resulting from copying another man's sign.

After all, it may be argued that the Patent Office fees are only a stamp duty, not *ad valorem*. There is much in the familiar plea for the encouragement of inventors by refusing to take their money for a useless application that might be used against the costly stamping of agreements not worth the paper on which they are written. Protection, as it is called, is already quite cheap enough in this country. The price does not cover the lowest estimate of the cost of making a search for colourable anticipation, even in the form of a patent. Mr. Lloyd Wise, as

we understand him, would extend the official search to all published matter, including old magazines and periodicals out of print. It is too large an order, especially at the price. The patentee does not deserve to be treated like the only child of the State. Generally speaking, he needs instruction far more than encouragement. Ninety per cent. of the patents granted by all countries are worthless to everybody; and it is a curious aberration that prompts men to desire the increase of the mass of lost labour, wasted time, squandered money, and disappointed hopes which is represented in this deplorable ratio of failures to successes.

COAL AND COAL MINING.

THE publication of a revised edition of the late Sir Warington Smyth's book on the above subject* is opportune, coming as it does at a time when the abnormally high price and the scarcity of coal is attracting so much attention in the industrial world. This, which is the eighth, edition has been revised and extended by Mr. T. Forster Brown, who occupies the post formerly held by Sir Warington Smyth—that of Chief Inspector of the Mines of the Crown and of the Duchy of Cornwall—and who is a well-known writer upon the coal question. In his preface, Mr. Forster Brown (who was assisted by his son) says that his object has been to maintain the author's original design, and to retain the general character of the book; but his anxiety not to unduly touch the original matter has, however (coupled with the fact that the book had been from time to time revised by Sir W. Smyth), brought about the unhappy result that the reader has to be constantly asking himself whether the statements before him refer to conditions existing ten, twenty, thirty, or even more, years ago, or whether to the circumstances of the present day. Mr. Brown would, in our opinion, have made the book of much greater value had he, in order to include only the latest available statistics, entirely re-written such chapters as that on "The Use of Coal," and "The Duration of the British Coalfields."

It is, in fact, quite misleading to have—as we find in the last-named chapter—the question of the resources of our coalfields dealt with in the main from the standpoint of one writing before the appointment of the Royal Commission on Coal in 1866 (to which no reference is made), and in the same chapter, and without any indication of difference in dates, the output of coal given as 200 million tons a year (as it was in 1897 or 1898), while the exports of coal are in yet another place referred to as "over 27 millions of tons," which was the quantity exported in 1889. As the author in his first preface declared that his book was "intended mainly to convey sound information to the unpractised," we do not think that Mr. Foster Brown can claim to have "maintained Sir Warington Smyth's original design," in publishing a chapter so calculated to mislead the uninformed. Subject, however, to this reservation, the book is to be commended to anyone desirous of learning something of the inner working of that vast industry which forms the backbone of the trade of the country, and without which the gas industry could not exist. For readers of the "JOURNAL," the most directly interesting section is that dealing with the probable duration of the British coalfields; and we must confine the remainder of this review to a consideration of the views of the authors on that most interesting and important question.

Of the importance of the question, the authors show themselves well aware: "Contented security may in its ignorance of the facts assume, and persons interested in maintaining their own special trade may represent, that the coal-seams are 'practically inexhaustible,' and may stigmatize as 'alarmists' those who would invite attention to the bearings of a question so vital to our immediate posterity. But a fair examination of the statistics . . . and of the local conditions of our coal-bearing districts, will show that at least the time for prudent forethought has arrived." Owing to the difficulty to which we have already referred, it is not possible to say—though from inference it is possible to surmise—when the foregoing was written. If in the sixties it was demonstrably premature to speak of the question as being then vital to "immediate posterity;" and even if (as we infer it was) written recently, we think it is taking too gloomy a view of the outlook to suggest an actual—as distinct from a relative—scarcity of coal as probable during the next generation. Considering that out of the 90,000 million tons estimated by the 1866 Commission to be available in the known coalfields in 1869—to say nothing of the further 56,000 million tons then estimated to exist in the concealed coal-beds at less depths than 4000 feet—we shall, by the end of this year (that is to say in 31 years) have only brought to bank just over 5000 million tons, it is impossible to feel alarmed as to the immediate future. That "prudent forethought" should be exercised, in the interests of our posterity, we should, however, be the last to deny; and a time like the present serves to remind all coal-users that care and economy in its consumption is a public duty, as well as true commercial wisdom.

The disadvantage of the dual authorship is, in this connection, shown by the fact that, while on the first page of the chapter on the "Duration of the British Coalfields," the question is spoken of as "vital to our immediate prosperity," four pages on we find the opinion stated that "the increase to our production of from 2 to 3 millions of tons annually, serious as it undoubtedly is, will keep us within comparatively moderate figures for a long time to come, and at all events defer—as regards the country at large—the evil day *for two or three centuries*." The former quotation is evidently the work of the reviser; the latter that of the author. The result is certainly not homogeneity.

As to the really important point—namely, not when the whole of our coal resources will be exhausted, but when the cheaply-worked coals, which have brought about our commercial supremacy, will become worked out—Mr. Forster Brown expresses the belief that a period of from 50 to 70 years hence will probably see their exhaustion, and "we shall become dependent upon more expensive fuel, and be rapidly outstripped by countries (such as America, China and Japan) possessing large and cheaply-worked coal resources." That, as has been repeatedly urged in the "JOURNAL," is a question which might well engage the attention of a Committee of Experts, appointed by the Government.

Mr. Forster Brown refers also to the possibility of our being handicapped in the struggle with Continental coal-producing nations for the possession of the foreign coal market, by the irregularity and combativeness of the miners. From recent events, in Austria, Germany, and France, it would not be unfair to infer that these other countries, who are our chief coal-selling rivals, are as likely to suffer from such troubles as we ourselves.

In spite of his somewhat pessimistic views regarding the future generally, Mr. Forster Brown is more optimistic than most authorities—including the Argyll Commissioners—as to the possibilities of deep coal-mining. Referring to the general consensus of opinion that below a depth of 4000 feet from the surface the increase of temperature would prevent the possibility of working, he remarks that "a considerable experience of deep mines induces me to believe that the difficulty of temperature may, by due appliances, be overcome to a much greater depth." As tending to confirm this view—or at any rate to prove the reasonableness of the contention of Professor Hull and the Coal Commissioners, that it was possible to work down to a depth of 4000 feet—it is of interest to note that at the Pendleton Colliery, near Manchester (the deepest mine in Great Britain), mining operations are being carried on at close upon 3500 feet below the ground; while the Calumet and Hecla copper mine in America has attained the enormous depth of 4900 feet, and a colliery at Mons (Belgium) is 3937 feet deep.

As to the question of imposing a tax upon our exports of coal, it is remarked that "such an impost would undoubtedly be open to serious objections," which contribution to the discussion does not carry us much further; but that "whatever may be the proper solution of this problem"—that is to say of the whole question of the increasing demands upon our stock of coal—"there can be but one opinion amongst thinking men, that the time has arrived when a thorough investigation of the problem should be undertaken with a view to minimize the disastrous effects to the commercial prosperity of the country that will surely arise from a neglect to consider, and take steps to provide against, a contingency which is already within measurable distance." The book ends with suggestions for the more economical production and utilization of the coal we do possess; special attention being called to the great advantage that we should derive by the cheapening of production through the adoption of coal-cutting machinery. That, however, is a proposal against which the miners in this country have, in their short-sightedness, set their faces; and it is not, therefore, likely to be adopted in the near future.

We will end this notice by expressing the hope that Mr. Forster Brown will before long completely modernize what even now is, but would then in a higher degree be, an interesting and useful little treatise.

* "A Rudimentary Treatise on Coal and Coal Mining." By the late Sir Warington W. Smyth, M.A., F.R.S. Eighth Edition, revised and extended by T. Forster Brown. London: Crosby Lockwood and Son; 1900.

The "James Forrest" Lecture.—This lecture was delivered at the Institution of Civil Engineers on Monday evening last week, by Sir William H. Preece, K.C.B., F.R.S., Past-President of the Institution; his subject being "The Relations between Electricity and Engineering." He said the four great principles underlying the practical applications of electricity are: (1) The establishment of a magnetic field. (2) The establishment of an electric field. (3) The disturbance or undulation of the ether. (4) The work done by the generation and maintenance of electric currents in material systems. He illustrated these principles by some simple experiments. Having considered the practical generation of electricity, the lecturer referred to its use in war, civil engineering, and sanitation, and discussed the subjects of the transmission of power, transformers, electric units, &c. His concluding remarks were as follows: "We can scarcely hope for new sources of energy to be discovered; but there are some existing ones we have not touched yet. When the evil day arrives for our coal supplies to give out, we may perhaps be able, by the aid of electricity, to utilize the heat of the sun and the tides of the ocean. There is, however, a vast illimitable store of energy not only in the rotation of the earth upon its axis, but in the internal heat of this globe itself. As we descend, the temperature gets higher and higher. It ought not to be difficult to reach such temperatures that, by thermo-electric appliances, we might convert the lost energy of the earth's interior into some useful electric form." The lecture was repeated on the following day.

PERSONAL.

Mr. JAMES MANSERGH has been elected President of the Institution of Civil Engineers, in succession to Sir Douglas Fox.

Mr. JOHN STEWART, Manager of the Strathaven Gas Company, has been appointed Manager of the Lanark Gas Company, in succession to Mr. John Gibb, who, as already mentioned in the "JOURNAL," has been transferred to Kirkintilloch.

Mr. E. JONES has resigned the position of Gas Manager and Surveyor to the New Mills District Council; and, in response to an advertisement, twenty applications for the post have been received. Three of the candidates have been selected to appear before the Council this week.

Mr. W. E. BARNEY, Secretary of the Horsham Gas Company, has been appointed, out of twenty applicants, Inspector under the Sale of Gas Acts, by the Middlesex County Council. He will have the supervision of the new meter testing and stamping office which has been erected adjoining Messrs. Thomas Glover and Co.'s new works at Edmonton.

It will be seen by the report of the proceedings at the annual meeting of the Singapore Gas Company which appears elsewhere, that the Engineer and Manager, Mr. ALBERT FORD, is now in England. Before leaving Singapore on the 23rd of March, he was the recipient of an illuminated address from the employees of the Company, who also presented him with a gold necklet, set with pearls and diamonds, for Mrs. Ford. Mr. Ford suitably thanked the donors for their gifts, and expressed the hope that all would go well while he was absent.

Mr. ARTHUR H. CANE, F.R.G.S., the Secretary of the Reading Gas Company, presided over a large and distinguished gathering at the ninth annual dinner of the Institute of Secretaries (of which body he is this year the President), held in the Empire Room of the Trocadero Restaurant last Friday. In responding to the toast of the evening, Mr. Cane dwelt upon the success of the Institute which had been very marked and continuous. The number of members had increased from 200 at the beginning to 1145 at the present time. But, still, he pointed out, seeing that there were upwards of 12,000 companies in the country, with as many secretaries, they might reasonably look forward to yet greater success in the future. The Institute had thoroughly justified its existence to business men and the general public. It had already accumulated invested funds to the amount of £2000; and he was glad to be able to state that many directors of companies were now showing their approval of the Society.

OBITUARY.

PETER SIMPSON.

There are times in the work of a journalist when he takes up his pen to record the end of the life and labours of a fellow man with particularly keen sorrow; and it is so on this occasion. Peter Simpson, who was beloved and honoured among gas men throughout the length and breadth of the country, passed from this life into the next alone and in the stillness of the night on Monday or early morning of Tuesday last week. Sad to say, the closing days of his life were filled with sorrow and anxiety. Pneumonia had stricken down the only son, and only child, Robert, who had arrived at middle age. Attacked by the complaint in an acute form, delirium set in; and the affectionate father and other friends had much to do to restrain the sufferer from leaving the house. Death claimed the son about one o'clock on Monday. Friends who were present with the aged parent during the day state that they remarked, although he had been somewhat indisposed during the previous week, how well he looked, and when the great trial came he bore it with the fortitude which was characteristic of the man in the time of trouble. But who can tell the anguish suffered beneath that stoical exterior? Mr. Simpson retired to rest as usual; but before daybreak, the spirit of the father had followed that of the son. Such an end to such a life as his is indeed pathetic. The medical attendant certified that death was due to syncope as the result of shock.

Mr. Simpson was esteemed in the gas profession more for his sterling personal qualities, than for any notable work he accomplished outside the Rugby Gas Company, of which he was the trusted and faithful servant for little short of forty years. In figure, in style, in his benevolent countenance, which mirrored the goodness of his kindly heart, he was a typical "fine old English gentleman." That figure, the hearty shake of the hand, and the pleasant greeting are memories which many will hold dear; and, for some time to come, at the meetings of the Midland Association and at the next gathering of the Gas Institute, the members will be painfully conscious of a void in their midst. Mr. Simpson's connection with the Midland Association dates from its origin in 1877, and rarely has he ever been absent from the meetings since then. He was present at the first meeting in October of that year; and was then elected Hon. Treasurer. He held this office for two years, during which time Mr. Charles Hunt was President. The selection of Mr. Simpson as Mr. Hunt's successor is a testimony to the great respect in which he was held among his neighbouring colleagues; and, by pressure, he was also induced to head the affairs of the Association for two years. In September, 1884, he was re-appointed Hon. Treasurer (Mr. J. Tindall having occupied the position during the intervening years); and he continued, without interruption, to hold the office until his death. On two occasions—once during his presidency and in 1892—he received, and generously entertained, the Association at Rugby. On his retirement from active work in the year named, the members, in wishing him enjoyment of his well-earned leisure, presented him with a handsome salver and silver antique cup, "as a token of their respect and esteem." Mr. Simpson was also an original member of the British Association of Gas Managers; and we believe that his cousin, who was then at Dunfermline, was one of the first three who met to discuss the question of founding such an Association. Through all times, Mr. Simpson has remained steadfast to the old organization; and for some years he has been a Trustee of the Institute, and a member of the Benevolent Fund Committee. He was not a prominent man in the public proceedings of the Technical Associations to which he belonged; but he was a quiet and useful worker and a trusty counsellor.

Mr. Simpson's record as the Engineer and Manager of the Rugby Gas Company is an interesting one. It commenced in 1854 and ended in 1892—the long period of 38 years spent in one service! It was on May 29 of 1854 that the Directors appointed him Manager out of 26 applicants for the position. Things were not then so flourishing as they afterwards became under his management. His remuneration was in those early days "£90 per annum, with house, fire, and light;" and it was stipulated that he should "devote the whole of his time to the service of the Company, and find security for £200." A few years before his engagement, the price of gas was 7s. 6d. per 1000 cubic feet. Four years after, it was 4s. 7d.; and the quantity of gas sold only about 9½ million cubic feet. Before he concluded his management, the price had been brought down to certainly 2s. 10d., if not under; and the consumption had increased something like six or seven fold. In the first years of his service, various extensions of the old works were made. In 1869-70, however, it was decided to remove the works to the present site in the Newbold Road; and the new works were constructed entirely from plans prepared by Mr. Simpson. The charging of the first retort took place in September, 1870; and at a meeting of the Directors on May 6, 1872, the following interesting resolution was passed: "That the new works, being generally completed, a present be made to Mr. Simpson of £105, and a gold watch and chain, with a suitable inscription, for his valuable services in designing and carrying out the new works in a highly satisfactory manner, and that his salary be increased £50 per annum from the 25th March last." In 1875, the Company was converted into a Joint-Stock Company with limited liability; and seven years later an Act incorporating the Company was obtained. From then, under Mr. Simpson's judicious management, the business continued to prosper and the works to expand. Advancing in years, in 1892 Mr. Simpson retired; and he was succeeded by the present Engineer and Manager, Mr. Charles Meiklejohn, who has successfully continued the work to which his friend and predecessor had devoted the best part of his manhood. On Mr. Simpson's retirement, the Directors presented him with a cheque for £100; and some two years ago, they wisely elected him to share in the administration of the concern which his labours had done so much to build up.

In the town itself, Mr. Simpson had become to be regarded with veneration. Good deeds, his sympathetic nature, his uprightness and integrity, and his endeavour to act justly to all men had endeared him to the people among whom he lived. He was one of the founders of the Congregational Church at which he worshipped, and had been Treasurer for many years. For the past few years, he had been a member of the District Council. Outside the chapel, the institution in which perhaps he took the greatest delight was the hospital. For a number of years, he was a member of the Management Committee; and he endowed a bed there in memory of his wife, who died as the result of an accident, in 1881.

Solemn and touching was the funeral of father and son on Thursday afternoon. The inhabitants of Rugby, rich and poor, thronged to the cemetery, and lined the pathways up which the *cortége* passed. Only immediate relatives assembled at the house of the deceased; but at the gates of the cemetery were representatives of the various bodies with which Mr. Simpson had been associated. The Gas Company were represented by the Chairman (Mr. John Parnell), the Vice-Chairman (Mr. A. J. Lawrence), and all the other members of the Board, excepting one, who was confined to his house through illness. The Secretary of the Company (Mr. T. M. Wratislaw) was also there; and the Engineer (Mr. C. Meiklejohn) headed, with the President (Mr. J. Ferguson Bell), the members of the Midland Association who were able at short notice to be absent from home—viz., Messrs. W. North, B. W. Smith, T. Berridge, W. R. Cooper, and V. Hughes. Mr. Tew, jun., was present on behalf of his father, who was unable through indisposition to attend. Among other of Mr. Simpson's friends who are associated with the industry were Messrs. A. C. Scrivener, T. E. Priestman, G. J. Eveson, and T. Vale. Floral tributes of regard and friendship were sent by, among others, the Directors and officers of the Gas Company, the President and members of the Midland Association, Mr. and Mrs. C. Meiklejohn, Mr. North, and Mr. Scrivener. After the completion of the burial service, the large crowd reverently filed past the grave; and they saw on the lid of the top coffin the simple inscription "Peter Simpson, Died 24th April, 1900, in his 75th year."

NOTES.

A "Blue-Flame" Oil-Stove.

It is announced in the trade journals that the gas cooking-stove is this season to encounter sharp competition from petroleum "blue-flame" stoves. The familiar oil cooking-stove, with a wick, has long been a common object of the countryside where gas was not available; but the apparatus always had its drawbacks, and at best demanded a degree of care in use which was not always available. It is now stated that petroleum-stoves without wicks are making good headway and giving great satisfaction to users. The so-called "blue-flame" oil-stove is among the latest of these. The American patent describes it as "a stove comprising a burner and oil reservoir in connection with said burner, and having a maintained oil level and means for raising or lowering one of said parts in relation to the other, the other part being fixed." One pattern of this stove has a reservoir containing a gallon of oil. The flow of oil is controlled on the principle of the bird fountain. The burners are of great power, and capable of performing a good deal of work. Naturally, there is no soot nor smoke from the highly aerated flame. The stove is recommended as being "wickless," and "valveless." It may not as yet do all that a gas-stove can do; but the manufacturers of the latter, and of the gas they consume, should be warned by the appearance of the new order of oil-stoves, which are a reminder that there is no monopoly in these things.

A New System of Electric Traction.

It is stated that those localities which have hitherto resisted the assaults of the trolley-wire tramway electricians are about to be rewarded by having at command a new system of electric traction which is to avoid all the drawbacks of the cheap and nasty overhead arrangement. This is called the Johnson-Lundell system, and great things are spoken of it. To begin with, it is on the surface-contact principle, thus doing away with all the troubles of both overhead and conduit methods of distributing the current. The success of the new system is reputed to be assured by the excellence of the detail arrangements of all kinds. It is not so much that the inventors have any extraordinary achievement to advance, as that they have patented improvements in dynamos, motors, controlling switches, methods of motor control, and a surface contact system of power transmission which, taken all together, constitutes an unrivalled combination. It is claimed, for instance, that the new generators can be built with 20 per cent. less material, and at 15 per cent. less cost, than corresponding machines of the ordinary design. The starting power, or "torque," of the motors is both increased and its application greatly simplified. Indeed, the inventors have succeeded in making the cycle complete, so that, when the car is running down hill, the motor becomes a brake and sends back current into the line. Thus a descending car will help another car up, just as if they were mechanically connected.

The Cost of Private Electric Lighting.

In the issue of the "Engineer" for April 20, an attempt is made to display the comparative advantages of electric lighting by a private installation and by current taken from a public supply. In all cases the lamps are supposed to be in regular use for 1800 hours per annum, or about 5 hours per day, and everything is equalized as much as possible. The private installation is given the choice between steam, gas, oil, and water turbine power. The last, of course, is the cheapest; but it is rather out of it except for unusually favourable situations. Fifty lamps of 16-candle power are supposed to represent the consumption. Coal is taken at 20s. per ton; gas at 3s. 3d. per 1000 cubic feet; and oil at 6d. per gallon. The first cost of the different plants would not differ very much, although the gas-power plant would always be cheapest, with or without accumulators. Altogether, the cost of maintaining 50 lamps for the period stated works out at £117 with steam power, £95 with gas power, and £97 with oil power. Adding accumulators, the expense is raised to £141, £114, or £115 per annum for the different sources of power. This seems a curious result of the introduction of the only electrical parallel to the gasholder. If electrical storage were practical, surely it ought to reduce working expenses instead of adding to them. Taking the necessary current from a public supply, the cost, at 2d. per unit, would be £46, at 3d. per unit £68 10s., at 4d. per unit £91, and at 5d. per unit £113 10s. Thus only at something less than the last price is a public supply come cheaper than the home-made article.

Nordenskiold on the Rare Earths.

Baron A. E. Nordenskiöld has discussed before the Geological Society some of the remarkable circumstances connected with the occurrence of the so-called rare earths. The first mineral mentioned in this connection was scheelite, and the next cerite, which contains no less than four rare metals. The bright incandescent light produced when the latter is fused with charcoal-powder was first observed by Cronstedt, in 1751. Nearly 130 years were to elapse before the observation was to be turned to useful account. The paper next referred to the discovery of glucina, lithia, selenium, and yttria. Minerals containing yttria and oxides related to it were at one time thought to be almost limited to certain pegmatite veins running in a broad zone on both sides of the 60th parallel of latitude. Latterly, fluocerite, orthite, and gadolinite have been found in Dalecarlia; and among these minerals, Benedicks discovered a silicate of yttrium containing 1·5 per cent. of nitrogen and helium. Thorium, discovered by Berzelius in 1829, was originally obtained from the rich mineral locality of Langesund; but it has since been recorded from many other localities. It is now obtained from the monazite sand of rivers in the Brazils and South Carolina. Thorite contains about 0·5 per cent. of inactive gas, probably a mixture of nitrogen and helium. The latter element was first obtained from the mineral cleveite, which also contains thorium, discovered by Nordenskiöld in 1877. Among the strange minerals is fergusonite, one of the richest sources of the remarkable gas, or mixture of gases, which on our planet seems to be almost exclusively confined to minerals containing rare earths.

Damp Houses.

In connection with the modern tendency of the extensive use of coke-breeze and gravel concrete in house building, Dr. G. M. Lowe, lecturing on "Damp Houses" before the general meeting of the Sanitary Inspectors' Association, made a strong appeal for the preservation of the porosity of walls in the interest of health. He said that damp houses must necessarily be unhealthy; and this condition is chiefly due to wet soils, wet walls, and walls impervious to air. All houses ought to have an impervious damp course in the walls, with the area enclosed by the walls covered with impervious concrete, or with tar paving. Dr. Lowe pointed to the fact that the painted walls of crowded rooms are frequently damp with moisture condensed from the atmosphere, which is saturated with carbonic acid and aqueous vapour, exhaled from the lungs and skins of the occupants. From this hot and dark atmosphere people pass into the pure, cold air outside, and wonder at the feeling of lassitude, headache, and chill experienced. The obvious remedy for damp houses is to cut off the cause: (1) By maintaining the porosity of walls and of roofing materials, so as to ensure free ventilation; and to construct windows that will open wide near the ceiling. (2) By cutting off all ground air and moisture by an impermeable layer of concrete or asphalt extended throughout the basement to the outside of the external walls. This point of the porosity of walls has not been much in evidence in the recent discussions on improved house building in which the members of Architectural Association have engaged. It would be well if the facts could be established by direct experiment.

Coke-Ovens in France and Germany.

According to the "Génie Civil," there are 410 regenerative ovens in the North of France—viz., 180 at Lens, 80 at Nœux, 60 at Drocourt, and 70 at Anzin—those at the two last-named places being on the Semet-Solvay system. There are some 60 ovens being built at Aniche, 120 near Douai, and 160 at Lens. In Germany, at the end of 1895, there were 7866 regenerative coke-ovens in operation—1864 being on the Ruhr; and among this number there were 1390 on the Otto system, which is by far the most common. They are about 30 feet long, 6 feet high, and 1 ft. 9 in. in average width. Their capacity is 6·650 metric tons of coal, which they convert into 4 tons of coke in 30 hours. In 1895, 210 ovens were built; in 1896, 302 ovens; in 1897, 240 ovens; and in 1898, more than 300 ovens. The latter are near the blast-furnaces in the Ruhr district. These ovens yield an average of 3·5 per cent. of tar, and 1·25 per cent. of sulphate of ammonia, and 0·35 per cent. of benzol on the weight of coke. Ruhr coal contains 1·5 per cent. of nitrogen; and the yield of sulphate is about 11 kilos. per metric ton. There is thus great room for progress. In 1880, Germany only produced 1200 metric tons of benzol, or one-eighth of the consumption; the remainder being imported from England. At present, about 2000 tons are used for the enrichment of illuminating gas; the proportion being from 4 to 5 grammes of benzol per cubic metre of gas, or from 1700 to 2100 grains per 1000 cubic feet. In Germany, only 5 per cent. of the gas is thus enriched. As in the ovens, the gases are first run through certain heavy oils which take out the benzol, this can be recovered by distilling the oils; and 92 per cent. is thus saved, while only 8 per cent. is left in the tar. At the beginning of 1896, 90 per cent. benzol was worth 65 frs. per 100 kilogrammes in France; in July, it was worth 100 frs.; and in November, 125 francs. During the last eighteen months prices have stood at 27 frs. to 32 frs. per 100 kilos.

The Recovery of Ammonia from Ammoniacal Liquor Without Distillation.—The Société pour le Traitement Rational des Vidanges employ, according to the the "Revue des Produits Chimiques," a method of recovering the ammonia from ammoniacal liquor without distillation, the principle of which is the addition to the liquor of a non-volatile acid, and the thorough admixture of the two by continuous agitation. The principle may be applied commercially in the following ways: (1) The liquids may be made to trickle on vertical surfaces or in cascades; (2) they may be passed separately in a fine state of division into a chamber, by the aid of a vaporizer; (3) or they may be agitated with blades, rotary brushes, or similar appliances, so as to bring them into contact with the air of a closed chamber. These various methods may be combined, and the absorption of ammonia increased by agitating the air by some mechanical means. The non-volatile acid preferably employed is sulphuric acid, concentrated or diluted. Sulphurous solutions, such as sulphate of potash, soda, or alumina, can also be used.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting in Newcastle.

The Forty-Sixth Half-Yearly Meeting of the Association was held in the Gas Office, Newcastle-on-Tyne, last Saturday—Mr. W. Doig Gibb, Engineer to the Newcastle and Gateshead Gas Company, the President, in the chair. There was a very good attendance.

THE ANNUAL ACCOUNTS.

The PRESIDENT, in submitting the annual accounts, said that the balance was £10 11s. 4d. more than it was in the previous year.

Mr. H. LEES (Hexham) suggested that the rules of the Association should be printed and issued to members and associates, along with a card of membership, yearly.

Mr. T. BOWER (West Hartlepool) said the Committee were about to reconsider the rules. Probably it might be sufficient at present to leave the matter with them; and a copy of the new rules could then be issued to every member.

This was agreed to.

NEW MEMBERS.

The following were admitted to the Association:—

Members.—Mr. Ernest W. Wright, Market Weighton; Mr. H. Lawton, Idle; Mr. T. Smith, Darlington; Mr. J. Sykes, Huddersfield; Mr. F. J. Bancroft, Hull; Mr. Thomas H. Duxbury, Bradford; Mr. T. Byrom, Yarm; Mr. J. W. Sturdy, Easingwold; Mr. R. Wood, Barnard Castle; Mr. W. Scott, West Hartlepool; Mr. O. Sisson, Barnard Castle.

Associates.—Mr. J. Duff, Morecambe; Mr. E. W. T. Richmond, Warrington; Mr. H. A. Fawell, Middlesbrough; Mr. J. H. Kemp, Harrogate; Mr. J. Petrie, Jarrow; Mr. F. Coulthart Sugden, Upper Armley.

The Association now consists of 83 Members and 53 Associates—a total of 136.

DEPARTED MEMBERS.

The PRESIDENT: It is almost inevitable that one penalty the Association must pay for increased membership is the sadness which all connected with it must feel when Death with his heavy hand comes into our midst. During my year of office, three gentlemen have passed away to the silent land—one associate member and two members. Mr. Thomas Havelock, of Newcastle, was one of the kindest-hearted men I ever met. To the poor, his unostentatious charities were many; to all, his cheerful smile and encouraging words made life more pleasant. His end came with startling suddenness. It was an eloquent tribute to his worth that rich and poor, old and young, united to show respect for his memory when all that was mortal was consigned to the silent tomb. We have also to mourn the loss of Mr. Trewhitt, of West Hartlepool. Ill-health prevented his attendance at many of our recent meetings, and I was thus debarred from becoming intimate with him. But he was one of the small band who originated the Association, and in his day did much good service for it both as member and President. The father of the Association has also passed away in the person of Mr. W. Hardie. His services to the Association as one of its founders, as a Past-President, and as its Secretary for a long number of years, are so well known and have been so appreciated as to require no eulogium from me. We must all regret that he was not allowed to enjoy longer the presentation which the Association recently gave to him. He had, if ever man had, the interests of the Association at heart. Nothing remains but for one and all to try and continue it in the same flourishing condition to which he raised it. This I hope will be his enduring monument. I have been brought into such close contact with him in business and in private life, that I am unable to speak what I feel; but as Secretary of the Association I am sure every member has experienced his kindness and his courtesy, and will realize that no words of mine can heighten or intensify the respect and love we all had for him. And now he is gone, and nothing remains but his memory. Mr. Penney and myself, in the name of the Association, sent a wreath to Mr. Hardie's family. This action, I am sure, the Association will approve of. We must not, I think, after this lapse of time, now open afresh the floodgates of sorrow and pain to the families of our departed friends; but we cannot but regret the events, and record the heavy losses which the Association has sustained.

MR. E. H. MILLARD ON "ALL SORTS AND CONDITIONS OF GOVERNORS."

The PRESIDENT said the members would remember that at their last half-yearly meeting they had a most interesting paper by Mr. Millard, of Durham, and that, unfortunately, there was no time left for its proper discussion. It was therefore thought advisable, rather than start a discussion and have to finish it in a premature way, to delay the full consideration of the paper till this meeting. He thought it was Mr. Terrace who suggested that by this time Mr. Millard might be able to extend his paper by giving his experiences of winter as well as of summer consumption; and Mr. Millard had kindly prepared some supplementary remarks and diagrams for winter consumption. He had great pleasure in calling upon Mr. Millard to read those supplementary remarks.

Mr. Millard's remarks were as follows:—

In the paper I had the honour of reading at our last meeting, I touched upon several different sorts and types of governors; noting, in passing, two or three points which had struck me in my own practice. I briefly drew your attention to the steady improvement effected in the design of station governors, particularly as regards the adoption of water-loading; and, considering its steadiness in loading and unloading, I am surprised to find the alteration of pressure still carried out in so many works by means of cast-iron weights lifted on and off by hand (sometimes a very heavy one).

From water-loading governors it is only a step to a self-loading governor. In these governors the loading depends upon the relative positions of a water vessel on the bell of the governor and an adjoining water supply; water flowing from the latter to the former and *vice versâ*, according to the lowering and rising of the governor bell in response to the consumption demands. Any manager of small works who has simply a single-lift holder, or who by any other means is able to maintain a constant inlet pressure to his governor, could himself, at the expense of a few shillings only, make such governor self-loading; and to any such I should be pleased to give any hints required.

It was the failure of my self-loading governor to act as I thought it should do which led me to get out a consumption diagram, when the explanation was clear—viz., that I did not know accurately the variations in the rates of consumption from time to time. I thought it would be interesting to see how far others succeeded; and I give you the results in the diagrams on the wall. I was asked to supply further similar diagrams in regard to winter consumptions, which I now do.

After referring in detail to these supplementary diagrams, the author said: At the last meeting, I submitted the proposition that the pressure diagram should follow the consumption diagram with minimum and maximum pressures determined with due regard to the satisfactory supply of the district. I would now take the opportunity of amplifying this by stating that, while it is possible to fix permanently a minimum pressure, it is impossible to so fix the maximum pressure, as the maximum hourly rate of consumption is a fluctuating quantity from year to year, and even from period to period of the same year—in fact, from day to day. In nearly all the diagrams I am inclined to think there is a fundamental error, in so far as the maximum pressure is applied prior to the reaching of the maximum consumption—in fact, the pressure is regulated as though the peak of the consumption curve were cut off or obliterated entirely. I apprehend that the reason the pressure is increased at all is that the supply mains, either arterial or distributory, are not large enough for the consumption at the period of maximum demand; while the same remarks apply with equal force to the supply-pipes of many of the consumers, who thus require a greater pressure at the meter outlet during maximum consumption than they do with the minimum consumption. Hence the greater need for the pressure diagram to conform to that of the consumption, particularly at the time of maximum demand.

Examining the self-loading diagrams, there is little doubt that, had the capacity of the water vessel on the governor bell not been restricted, the outlet pressure given would have followed the peak of the consumption curve. In my own particular case, take the morning consumption, when the pressure does not attain its maximum, and you get the peak on the pressure diagram similar to the consumption peak. Although Mr. Whatmough, in his paper on a similar subject read at the meeting of the Manchester District Institution in September last, does not give consumption diagrams, yet in the two cases when the pressure does not reach its maximum (diagrams 5 and 6 illustrating his paper) you see the peak form in those pressure diagrams. One thing brought out on these diagrams in an especially clear manner is the fact of the long time taken to reach the maximum from the time of commencing to light up; so that even in a Lancashire mill town this process requires over an hour, and in the majority of cases is spread over two hours, while the decreasing consumption extends over double the time in each case.

I have also prepared two diagrams relating to the supply of electricity, which, while being outside the scope of this paper, are not without interest. In these the same points, not to say peaks, are to be noticed; and we may comfort ourselves with the fact that the ratio between maximum and minimum consumption is not nearly so high in our own case as in theirs.

I was reminded, after the last meeting, that I had omitted to make any reference to lamp-governors. This was done purposely, as I considered the paper quite long enough for the time at our disposal. Having obtained a fresh lease of your time, I may just say that I was led astray by the ambition to be in the fashion, to adopt the small viewly metallic governors for the public lamps. I can only say that I am now returning to the old tried and true, though not so comely, love, the leather diaphragm governor, next to which I would place the soapstone float type of governor.

Discussion.

The PRESIDENT said he had no doubt they had all read Mr. Millard's previous paper before coming to the meeting. The paper, and the supplementary remarks, simply bristled with controversial points. He did not believe for a moment that Mr. Millard expected them to agree with him in everything. In

fact, he was sure, from what he knew of Mr. Millard, that he would rather like some to disagree with him. He had just noted that Mr. Millard, in his previous paper, alluded to the use of gas-engines for exhausters, and the different forms of bye-pass arrangements in connection with gas-engines. Then he touched upon loading by water, referred to compensating chambers, and discussed various forms of valves. He went very fully into the relationship which should exist between the consumption of gas and the pressure of the gas at the works; and he wound up by mentioning lamp-governors. In all these things, there was ample scope for discussion. They had fortunately more time that day than they usually had; and he therefore expected a discussion worthy of the name.

Mr. H. Lees (Hexham) said he was quite sure Mr. Millard was anxious that there should be a good discussion; and he hoped, in the interest of the subject, and for the honour of the Association, that he would not be disappointed. In his original paper, Mr. Millard made some remarks as to the style of his writing. He did not think that any gentleman need apologize for style, if he was prepared to carry that style to its logical conclusion. He (Mr Lees) knew it was somewhat difficult to do so in the case of a metaphorical and allegorical style. Mr. Millard introduced to them an individual who afterwards turned out to be a governor which was guilty of certain indiscretions, so much so that he was unable to walk upon a straight line, any more than diagram No. 7; and this he attributed to water. It was, perhaps, too much to ask them to adopt the same conclusion. However, Mr. Millard did not leave them there long; for he had now brought before them a series of diagrams which, he was sure, would be full of interest to them after the meeting, because, although many of the points he had raised did not exactly deal with the question of governing, they were yet of considerable interest and value to them. When they studied these diagrams again—as he hoped they had done since their last meeting—he fully trusted they would find something more in them than they had yet done. The question of pressure was one which had been considered at several meetings within the past few years. It was surprising how some people changed their views. He noticed that one member took exception, in some form or other, on the occasion when Mr. Chester had, in connection with a paper, shown some diagrams obtained by a self-loading water arrangement, and asked why this should not be worked by hand. Of course, Mr. Chester made the only reply he could—that it might have been done by hand had the hand been there at the proper time, and known the proper time to do it. The same member, at a meeting of the Manchester District Institution, asked why they should have governors at all. He believed that they, in that Association, had long since decided that it was advisable to have governors; and he thought that these diagrams would convince them upon the point. There were many questions with reference to the regulating of the pressure for districts and difference in levels, and the dividing of the districts into sections; and, in addition, there were the difficulties in connection with the smallness of their own mains and of consumers' fittings, all of which made the subject a very complex one. Anything which might be advanced with a view to the removal of some of these difficulties would be a considerable help to them. Mr. Millard had done a great deal in this direction. In his own case, he supposed that he would require to apply some of the principles laid down, and he would then see whether he could accord with them. The comparing of the consumption with the pressure diagram would be very useful to him. He thought they would find that the consumption varied to an extent they did not expect. The self-loading governor had not always met the expectations of those who had adopted it. He could not account for this. But that it was a step in the right direction he thought they would admit. A short time ago, Mr. Chester brought before the Gas Institute a scheme that got rid of the difficulties which the self-loading governor did not. Mr. Millard referred to it; but perhaps it did not come within the scope of the paper. He thought they were much indebted to Mr. Millard for his communication.

Mr. D. Terrace (Middlesbrough) said that Mr. Millard had given them, very fully, the whole of the possible facts in connection with governing and pressures—or rather, he should say, the pressures and consumptions for nearly every occasion they could imagine. The President had referred to certain diagrams with which he had some connection. The high-pressure mains, so far as he could ascertain, had always been laid with a small pipe on the top to bring back a record of the output, and to let them know at the works what to do when there was a draught on the main. He thought this was a much better plan than depending on a governor-bell as an indication of the consumption, because, in the one case, they were in the heart of the consumption, and, in the other, the governor-bell was at the one end, and could not tell what was wanted at the centre. He therefore believed the small pipe the more reliable principle to go upon.

Mr. C. Dru Drury (Sunderland) thought they were all very much indebted to Mr. Millard for what he had brought out so clearly. Many of them, perhaps, had not realized the nicety with which they could adjust the pressure to the consumption; and the diagrams would be a most interesting study to them all, and would probably make them take up the subject much more keenly than they had done. While they should look and strive to work towards an ideal, it was not always possible to do so. In many cases gas managers had to make much smaller mains serve the purpose than they would if they had to begin *de novo*. This would, therefore, probably explain the rather odd diagrams they would find if they were to work out matters as shown. Of course, this need not prevent them in any way from attempting to get an ideal system. He could not see that there was much advantage in water loading, as compared with loading by weights. In any event, the work must be done by hand. He was not speaking of self-loading governors. With water loading they got a more regular pressure, but still the attendant who was there must weight it; and he might easily leave it too long, and effect a change in the pressure which would not be desirable. He thought it was a case of automatic changing; and he did not see why they should not stick to weights in the matter of loading.

Mr. W. J. Warner (South Shields) said he was quite familiar with all the diagrams he saw before him, except that in which the indication was the maximum consumption; and he thought that the whole thing was met by a reference to the pressure having to be maintained though the consumption might be reduced through the later hours of lighting. Till they obtained a perfect system of meters, service-pipes, and fittings, he thought that the maximum pressure would have to be maintained till the later hours of the night, though the consumption should fall very considerably. There was one point which had not been referred to, with reference to the return-pipe, which gave, at the works, the pressure in a central position. This furnished an indication of what the pressure should be at the point from which it was brought back; but that was no new idea. He thought it must be between thirty and forty years ago that it was adopted by a Frenchman, and, if he remembered aright, was worked in Paris. But in that case the return-pipe did not stop at showing the pressure; it acted on the governor itself, adjusting it to the pressure at the point of consumption. Mr. Millard touched upon the merits of metallic or diaphragm lamp-governors. He had had both in use for a great many years. They tested some thousands of them during the year; and only the other day, when he asked which was the best governor, he was told that they thought the disc was the best. He himself, however, was somewhat inclined to the diaphragm. In the disc, they got the dirt inside; and in the diaphragm they had the hardening of the material, which affected the consumption. The subject before them was a very interesting one. It was one he had studied for a great many years. They knew that the double cone was at work nearly thirty years ago. There was the other method, of counterbalancing, which, he believed, had originated in his own works. It was not so necessary now, in large works, where the districts were supplied through several governors; but in small works it was one of the best things, he thought, which could be adopted.

Mr. J. Hepworth (Edinburgh) said he rose with some reluctance to speak on the question before them, but he had none whatever in tendering his thanks to Mr. Millard for his very valuable paper, and especially for his most interesting diagrams. Mr. Millard had been very modest in his paper. He (Mr. Hepworth) really considered the author had given them the evolution of a governor, though he said, he thought, in his former paper, that he felt it somewhat difficult. Mr. Warner referred to the governor which accomplished more than the return-pipe spoken of in the cases of Durham and Middlesbrough. This governor was at work, as he happened to see it some two years ago, in Germany; and it was answering the purposes for which it was intended, as, he had no doubt, the arrangement at Durham did which had been referred to by the author. In the case of the French invention, it did not simply impart information at the governor station as to what the pressure was in the middle of the town or at some other point, but it immediately put on or took off the pressure as required. It was a good many years since he first employed a governor; but, oddly enough, the first one he used, more than thirty years ago, was a water-loading governor. He liked a water-loading governor. He had heard, as an objection to it, that it took such a time to put on pressure. There was no difficulty in putting that right. If the pipe was not large enough, they should make it sufficiently large, so that, if needed, the pressure might be applied in a shorter time. But, as Mr. Millard had pointed out, in one case the pressure was found to be put on more rapidly by water than by hand loading. Governors were now well made by most manufacturers; and they performed so well the functions they were intended to do, that there did not seem to be very much more left to accomplish. Mr. Millard's paper and the remarks which had been made all seemed to point in the direction of some ideal state of things, which at present, perhaps, had not been reached. It occurred to him, with reference to the small pipe referred to by Mr. Millard and Mr. Terrace, that he might ask what the effect would have been if, in the small pipe, an electric wire had been placed, not only for conveying the information, but, as in the case of the foreign governor referred to, for automatically putting on the pressure, whether the man were there or not, or taking it off. He thought they were looking forward to the time when, perfect as things now were, they should have an ideally perfect governor, which would not only be automatic, giving what information was required, but doing what was needed as well as telling someone else to do it. All the diagrams seemed to him to point to the necessity for a closer knowledge of the actual condition of things, which they possibly could get better than by a man sitting in the governor-room. The man did not know what was the real state of affairs in the

town. He did not know what sudden demand might arise, or when the demand might cease. Therefore, if they could get the perfect instrument which was here diagnosed, they would have, he thought, very little more to discuss in relation to governors. It had been mentioned that the great difficulties in the matter lay not only with the governor but with the engineer in the constantly altering condition of things as regarded the distributing mains, and the great differences which came to exist with respect to the requirements of a district. If their mains were perfect to-day as regarded size and capacity, they knew what would happen next week, if the town were a prosperous and growing one. The mains would be insufficient, at all events next year; and nobody proposed to put a new main in every year, or even ten years. The conditions were always altering. A consumer started with five lights, and in a very short time he was using five-and-twenty. These were difficulties which possibly no engineer was quite able to cope with; but there was no reason why, at all events, they should not look in the direction in which Mr. Millard had been leading them that day, with the view of getting the most perfect governor they could to meet conditions which were somewhat complex, and which, unfortunately, were always varying.

Mr. F. P. Tarratt (Darlington) said he should like to call attention to one of the diagrams. The governor here did not give way in correspondence with the curve showing the maximum consumption, although, as he understood, it was a self-loading governor. It appeared to drop for a couple of hours, and then afterwards to regain the high peak.

The President concurred in the remark that the paper gave room for very great reflection, when at their leisure. He was quite certain that nearly all of them were more or less guilty of possessing some of the defects in their arrangement of pressures which Mr. Millard had pointed out. It was, of course, the case —as Mr. Drury, he thought, had said—that they must do the best they could in their varying circumstances. They were not all blest with efficient mains; nor were they blest with a gas consumption which always went on equally at the same time each night, and continued according to diagram. He found, in Newcastle, for instance, that their consumption at night varied enormously, and even on two following nights, owing to some darkness or otherwise. He thought the only criticism which he could give upon Mr. Millard's paper was in the sentence where he said that the pressure diagram should follow the consumption diagram. He held, most emphatically, that no system of governing could be proper, or be theoretically perfect, unless the pressure diagram anticipated the consumption diagram. It was not sufficient, he (the President) thought, that the consumption on the mains should so reduce the pressure as to give indication of it in the governor-house. They must anticipate the greater demand that was to come on the mains. Of course, it was not right that they should anticipate it by hours. It was quite right, as Mr. Millard had pointed out, that they should note it as often as possible; but still they should anticipate the demand if they were to be safe.

Mr. Millard, in closing the discussion, said he thought they had let him off very lightly indeed. He thought that there were openings in the paper where he might have been tripped up; in fact, if he were to start now, he thought he might trip himself up. The first point Mr. Lees criticized him upon was not in his paper at all; it was a remark he made upon another gentleman's paper at another meeting altogether. With reference to Mr. Chester's paper at the Gas Institute meeting, Mr. Chester made a great point that, by means of an electrical indicator, he had arrived at the conclusion that, in order to get at the period of maximum consumption at the end of a district, he required 4-10ths or 5-10ths more pressure than he had been accustomed to put on. A diagram, straight off, in the first instance, would have told him that, if he had had another 5-10ths at the governor, he would likely have got 4-10ths or 5-10ths more at the end of the district. In the diagram Mr. Chester submitted, before the electrical appliances were fitted, there was a red line to indicate the line the governing man was to take, and which showed how the man had attended to his instructions. This was similar to what he showed in one of his diagrams, and similar to what Mr. Terrace had introduced. He showed it so as to indicate how, by means of a district governor, he got off the day pressure. If he had started his diagram at the time the pressure at the far end began to droop, and had loaded until the time when the far end of the district was at its minimum, had gone on in a gradual line, and then had, at that period, followed the governor action, he should have had a strictly level line in the district. Take Mr. Terrace's diagram, which he prepared when he wrote his paper of (he thought) 1893, it really led Mr. Terrace to come to this method of coping with his pressure. Mr. Terrace started about a quarter to four, and loaded until about half-past four. The town followed the same line, and the district also increased —showing most conclusively that the pressure was put on too early if the idea was to maintain a regular pressure on the district. It was maintained too long, because, in the district, at ten o'clock, the pressure began to go up again; and it would have been an advantage to have taken the pressure off at ten o'clock, instead of letting it go on till half-past eleven. There was a dead-level from four to eleven. If they inverted the diagram of the district, to get it as the works' pressure, they would almost get a level-line in the district. Mr. Chester's electrical apparatus showed most conclusively that, when he loaded his governors to what were his own preconceived notions of what the consumption was to be, he was an hour out of it. The pressure was on the diagram an hour before it was required; and it followed thus all the way through. The only objection he could see to the high-pressure pipe in the main was that it required a man's continual attention in the governor-house. In works the size of Mr. Terrace's, a man's wages were as nothing to the securing of an even distribution of pressure; but it was different in works of his (the speaker's) size. The great danger in loading by weights was that the pressure was put on at once, as the diagrams showed; but water-loading was more regular, and was therefore superior, because the intermediate steps were really drops of water. What he maintained was that the movement of the governor-bell gave them the nearest criterion they could have as to the gas consumption. Mr. Warner mentioned about the return-pipe, forty years ago, acting on the governor-bell. But it was a question whether this was altogether an advantage, because the pressure at what might be termed the outlet of the high-pressure main would require to vary about 1-10th or 2-10ths; so that, to a certain extent, the governor would respond, but it would simply maintain one level, and increased pressure would not be got in the district, to cover the period of maximum consumption. In such an arrangement, not only must the governor itself maintain the pressure, but it must give increased pressure to cover the defects, not only of the mains into the heart of the district, but also of consumers' fittings. Mr. Hepworth spoke of many members probably not knowing what took place from time to time in the several parts of their supply, outside their works. He could go farther than this, and say that they did not know from the works the five-minutely consumptions, as he knew, because, in order to get his pressure diagram, they took observations of the holders every ten minutes. He had tried to point out, in one of his diagrams, how very closely the governor-bell varied with the consumption. He did not say that it was a perfect system, but he could say it was better than anything they had, for works of his particular size. He would not, however, go the length of asserting that it was the only governor for large works. He was sorry to say that nobody had given him a hint as to the difficulty he had shown in another of the diagrams. The governor there worked very well until incandescent lights were fitted up, after which (when he took off the pressure at midnight) the bye-pass lights of the burners went out, because of the jerking action; and he had to discard the governor. With respect to the distributing mains, it was certainly absolutely necessary, from time to time, to take simultaneous diagrams (such as Mr. Terrace took) at the works, and in different parts of the district. He had been accustomed to follow Mr. Warner's plan, of having testing-pipes on the mains, and sending his own men to test them. He was afraid he had sometimes been misled by them, because of their not having been fortunate enough to have hit upon the exact five, or ten, or fifteen minutes during which the maximum consumption was going on, and which would, of course, greatly vitiate the results. The reason for the governor not giving way, as Mr. Tarratt observed, was that it had attained its maximum pressure when the maximum consumption was 25,000 cubic feet per hour; and the engineer had said that this was as far as he wanted to go with the consumption. If the governor had not been restricted as to capacity, there was not the slightest doubt about it, that the governor-bell would have responded to the increased consumption. This was the point upon which, he said, all the diagrams except one were behind the mark. The President had said that consumption varied enormously. Of course, it did; and it was the inability to know that the consumption was varying which led to all their present troubles. If the President's consumption jumped up enormously, his governor would drop. If it did so, that would be a very good criterion as to the consumption. The President took exception to his saying that the pressure followed the consumption. He really should apologize for expressing himself so badly. What he meant was that the lines should be similar in shape, and that they should be actually simultaneous, as they would be with a governor which was acting efficiently. There was one trouble which they found when they tried to have excess pressure put on beforehand; and he thought this was really the crux of so many complaints. Take Mr. Terrace's diagrams; the people evidently lighted up about half-past four, when they had about 20-10ths—an excess of pressure. When the pressure was on, they would very likely check their taps; but when the consumption in the district took away the pressure, the question was whether they adjusted the taps again. They must all do the best they could in the varying circumstances in which they were placed. It was a question whether any of them were more unfortunately placed than he was as regarded the district he had to serve. There were in his district some hundreds of feet of rise and fall; and it was a most difficult matter indeed to keep the pressure anything like so regular as he would like it.

Mr. W. Ford (Stockton) moved a very hearty vote of thanks to Mr. Millard, for his most interesting and really instructive papers.

Mr. T. Bower (West Hartlepool) seconded the resolution, and it was adopted.

Mr. Millard acknowledged the vote.

Election of Office-Bearers.

The President announced that the result of the ballot for the election of office-bearers was as follows:—

President.—Mr. E. H. Millard, of Durham.
Vice-President.—Mr. M. Dunn, of Goole.
Auditor.—Mr. H. Lees, of Hexham.
Hon. Secretary and Treasurer.—Mr. J. H. Penney, of South Shields.
New Members of Committee.—Messrs. W. Cowley, of Spennymoor, and T. Hardie, of Gateshead.

Mr. Millard returned thanks for the honour conferred upon him in electing him to the office of President, and stated that they in Durham would be very pleased to see the Association there at their next meeting.

Vote of Thanks.

Mr. J. H. Cox (Sunderland) proposed a vote of thanks to Mr. Gibb for the able manner in which he had presided over the meetings.

Mr. Dru Drury seconded the motion.

The President returned thanks, and the business proceedings closed.

The members and friends afterwards dined together in the County Hotel—Mr. Gibb in the chair. In the course of the proceedings, the Chairman intimated that Mr. Ford, of Stockton, was about to take a voyage to America, for the benefit of his health; and he was sure they all wished him God-speed and a happy return.

Presentation of Addresses to Mr. J. H. Cox and Mr. Chas. Sellers.

A pleasing incident in the midst of the toast-list after the dinner was the presentation of Jubilee Addresses to Mr. J. H. Cox, of Sunderland, and Mr. Charles Sellers, of York. The addresses were engrossed upon beautifully illuminated cards, framed in gilt. They each displayed the coats of arms of Newcastle and of the respective towns in which the gentlemen reside, as also a couple of views in Newcastle and a couple in their respective towns. On account of some of the members being obliged to leave for home by early trains, the unusual practice was adopted of displaying the address in the dining-room before the company sat down. They were much admired for their execution and the general scheme of colouring. The terms of each were:—

The North of England Gas Managers' Association very heartily congratulate John Henry Cox, Esq., on the completion, last year, of his Jubilee of Service as Manager and Secretary of the Sunderland Gas Company, and on the faithfulness and efficiency with which such service has been rendered, as manifested by the spontaneous recognition of his merits by Directors and shareholders alike.

The Association regard with pleasure their sense of the good work done by Mr. Cox, as one of the promoters and Past-Presidents of the Association, and as one who has materially assisted in raising it to the satisfactory position it now holds; they cordially convey, at the same time, their best wishes for his health, happiness, and prosperity.

Signed, on behalf of the Association, at Newcastle-upon-Tyne, this 28th day of April, 1900.

President—W. Doig Gibb; Vice-President—E. H. Millard; Ex-President—C. Dru Drury; Members of Committee—T. Bower, W. Ford, M. Dunn, A. B. Walker; Hon. Secretary and Treasurer—J. H. Penney.

The North of England Gas Managers' Association very heartily congratulate Charles Sellers, Esq., Secretary and Manager of the York United Gaslight Company, on the recent completion of his Jubilee of Service with that undertaking, and on the faithfulness and efficiency with which such service has been rendered.

The Association regard with pleasure their sense of the good work done by Mr. Sellers, as one of the promoters and Past-Presidents of the Association, and as one who has materially assisted in raising it to the satisfactory position it now holds; they cordially convey, at the same time, their best wishes for his health, happiness, and prosperity.

Signed, on behalf of the Association, at Newcastle-upon-Tyne, this 28th day of April, 1900.

President—W. Doig Gibb; Vice-President—E. H. Millard; Ex-President—C. Dru Drury; Members of Committee—T. Bower, W. Ford, M. Dunn, A. B. Walker; Hon. Secretary and Treasurer—J. H. Penney.

In making the presentation, the President said: We now come to the most important part of to-day's proceedings. Of the small band of gentlemen who were the founders of the Association, we fortunately have yet several left. They have borne the brunt of the battle and the heat of the day; and though perhaps not now so vigorous as once they were, we rejoice that they are generally still hale and hearty, and can and do give the Association the benefit of their ripe understanding and great experience. Two of these gentlemen have now served for over fifty years with the respective Companies with which they are both still connected—Mr. J. H. Cox at Sunderland, and Mr. Charles Sellers at York. I do not know whether to describe myself as still young or as middle-aged; but, in comparison with those we honour to-day, I may still consider myself young. It might therefore be deemed presumptuous on my part to personally act as I am doing, though I yield to none in my personal desire to do our friends honour. But I act to-day in a higher capacity. The Association have done me the honour to appoint me their President; and it is as their President, and as the mouthpiece of the Association—and, I may add, our Association as a unanimous whole—that I assure our friends that we unite in heartily congratulating them. Their cases cannot be separated. They are both of them founders, energetic helpers, and Past-Presidents of the Association. They have served their respective Companies with conspicuous ability and devotion. They are always ready to help and to advise their more inexperienced or less fortunate friends. They both have a fund of humour, and are always cheerful. I ask confidently, where can any other Association produce two such men with such records? The Association thus not only honours them, but our friends honour the Association with their presence. We congratulate them most heartily on the attainment of their Jubilees, and wish them health, strength, and happiness for many years to come. That the congratulations may be recorded in a tangible form, I now ask their acceptance of the illuminated addresses which the Association have had prepared for them; and I hope when these are hung up in their respective homes, they may often serve as reminders that they were the men whom the Association delighted to honour.

Mr. Cox said he was greatly indebted to the President for the very handsome manner in which he had brought this matter before the company. He felt considerable difficulty in expressing his thanks for the honour the Association had done him. He was exceedingly obliged to the members for their kindness. His connection with the Association had been a very pleasant one. When it was established, there were faces there whom they now sadly missed. Among them were Mr. Trewhitt, Mr. Hardie, Mr. Wallis, and Mr. Cowen. These had all "gone over to the majority;" but there were young men following them who, he was sure, would make a mark for themselves. The gas industry had made great strides since he was first connected with it. He remembered in Newcastle, not fifty years ago, a square gasholder, confined within heavy walls for fear of explosion. He had seen, at Seaham, a gasholder made of wood and cork, just like a ship. At that time gas was 7s. 6d. per 1000 cubic feet; it was now considerably less. Coal was then half-a-crown a ton; and other things were in like proportion. Whatever might be the ultimate result of the present high price of coal, there was no doubt that there were good times in store for the gas industry.

Mr. Sellers said there might be individuals present who could readily find suitable language with which to clothe their acknowledgments of such generosity as they had shown to Mr. Cox and himself, but he must confess he experienced the greatest difficulty in doing so. The feeling that was uppermost in his mind was one which prompted him to simply, but seriously, thank them for the great honour they had done to him. For if he were to speak for an hour, all he might say would resolve itself into that expression. He thanked the President for the very kindly references he had made to him; and he thanked the members for the hearty way in which they had endorsed the President's remarks. But they would permit him to say that in their great generosity they had reversed the world's ruling of cases especially like his own; for, instead of putting his many shortcomings as a member of the Association in the forefront, and applying Shakespeare's definition of the world's ruling—that

> "The evil that men do lives after them,
> The good is oft interred with their bones"—

he was aware that, burying the evil which he had done, and the shortcomings of which he had been guilty, they had put in the foreground all the good he had ever done, and had given that good emphasis and prominence and a long life. He was quite aware that there was a marked difference between the position filled by himself and that occupied by Mr. Cox, upon whom they had conferred a similar compliment to that which they had put upon him. From the time the Association came into existence down to the present, Mr. Cox had always most loyally and faithfully done his very best to promote the interests of the Association; while he (Mr. Sellers) had been the chief of sinners. He had neglected his duty, and therefore he could not feel that he was deserving of the compliment they had paid to him. He had not only committed sins of omission, but he had committed sins of commission which were rather worse. But when he referred to the difference in their positions, he meant it also in a domestic sense. Mr. Cox had chosen the better part, and had become the head of a family; and he (Mr. Sellers) felt sure that every member of that family would rejoice with Mr. Cox that day for the honour the Association had conferred upon him, and would hand that compliment down as an heirloom. He (Mr. Sellers) had no family to rejoice with him, and no family to whom to hand down the heirloom. As he looked round the tables, he could see, in his mind's eye, several vacant chairs where dear old friends used to sit—friends with whom he had worked shoulder to shoulder, with pleasure and profit to himself, and with benefit to the Association. And when he looked again round the table, he could see several old colleagues, who, like himself, were fast travelling on to "the sere and yellow leaf," as might be seen by the crop of silver threads among the gold. Before he sat down, he wished to express the feeling which was uppermost in his mind, and that was that he felt thankful that he had had health to reach the fifty years' jubilee at which he had arrived; and he felt sure that Mr. Cox would join and share with him in that expression. And, although they would never have another jubilee—for it was not given to any man to attain but one such jubilee—they could do the next best thing, and wish, heartily and sincerely, that at least some gentlemen who were in that room would reach that happy period, and receive a similar compliment to those which the Association had paid to them.

OHIO GASLIGHT ASSOCIATION.

(*Continued from p.* 1061.)

General Andrew Hickenlooper, of Cincinnati, read a very interesting paper on "Street Lighting," commencing with a full historical introduction, tracing the progress from prehistoric times to the introduction of gas, and touching upon the earliest installations, both in England and America. In regard to the volume or quantity of light necessary, he said it was absurd to advocate the use of lights of great intensity, where economical considerations precluded their being used with such lavish prodigality as to produce a uniform effect, as the system that gives the greatest uniformity of illumination over the whole surface to be lighted, is the most serviceable. The duty of a municipality was not fulfilled by brilliantly illuminating a few prominent thoroughfares at the expenses of the back streets and lanes. Illuminating power was not the same thing as illuminating effect; no photometer yet invented would accurately gauge the efficiency of any street lighting system. It was one thing to produce an intensely concentrated light, but quite another to utilize the same in a manner proportionate to its intensity. The very brilliancy of the source might prove a detriment rather than an advantage; so it was a mistake to regard the candle power as a fair representation of practical value. Petroleum, gas, and electricity were the three systems of lighting competing for public favour. Oils were not acceptable where gas or electricity were available; and the incandescent electric light was totally unsuited because of its inherent defects, limited power, and excessive cost. As the Company with which he was connected was to-day supplying two-thirds of the private electric lighting, both arc and incandescent, in the city of Cincinnati, he could claim to be in an independent position, and prepared to fairly consider the relative merits of arc electric and incandescent gas lamps. No one could deny that a 200-candle power light was more brilliant than a 20-candle light; but it did not follow that the former was more suitable as a unit of light, especially if the perceptive power of the eyes was exposed to alternate intensity of light and darkness. The effective rays of the arc light were confined to an area represented by 30° above and below the horizontal line, and there were inherent practical defects due to the variation in the adjustment of the carbons, producing flickering, change of colour, &c., that could not be compensated for by monetary consideration. The term "2000-candle power," though meaningless, deceptive, and grossly exaggerated, was, like any other frequently, persistently, and impressively told lie, accepted by the public, without regard to the fact that under the best conditions the lamps had never been proved to exceed a fourth of this rating; and this subterfuge was still being practised as a means of securing street-lighting contracts at a price greatly in excess of the previous charge for gas. But the ghastly glare, the deep shadows, and the frequent interruption have dispelled the eloquence of the speculative promoter, and the arc lighting craze was now at an end. Electricians themselves now acknowledged that attempts to measure the candle power of arc lamps had proved to be failures, and that the 2000-candle power claim, French measurement, and other exaggerations were a mistake. The opinions of eminent authorities were quoted, showing that 500 candles is a liberal estimate for a 450-watt arc lamp. Some tests made for the author on an arc lamp in actual use, showed a variation within 17 minutes ranging from 40 to 226 candles; and the average of the tests, which comprised eleven readings, was 96-candle power. The lamp was at the same time supplying an average of 288 watts, instead of the 460 watts required by the contract and paid for by the city. The Electric Company were supplying 3325 arc lamps for 3820 hours per annum, at the rate of £17 per lamp. If the value of 460 watts per hour was £17 per annum, then the city was only receiving something less than £11, and was losing about £20,000 per annum. These 3325 arc lamps, costing £56,500 per annum, had replaced 12,000 gas and gasoline lamps which cost just over £42,000 per annum—representing an increased cost to the city of over £14,000 per annum. Several tests made by Professor French averaged 164 candles for a 460-watt arc lamp, which corroborated the author's result of less than 100 candles for 288 watts. The increased cost, and uncertainty of the light, had led to public protests being addressed to the Board of City Affairs, requesting that, if the Welsbach gas-burner could not be introduced, a return might be made to the old system. Attention was then directed to the Welsbach gas-burner and the progress it had made as regards street lighting. At Munich, over 7000 Welsbachs now replace the ghastly glare of the arc lamps, and the principal thoroughfares of Paris are now lighted by Welsbach burners. Berlin, acknowledged to be the best lighted city in the world, had discarded arc lamps, and now used 35,000 incandescent gas-burners. Liverpool, finding that electricity was six times as costly as gas, had disregarded its own electrical works in favour of a contract with the Gas Company. Bolton and other cities in England, also the principal cities of the United States, had followed this example. At Cincinnati, three of the main suburban avenues, representing a length of over 4½ miles, were lighted by Welsbachs, averaging 40 yards apart, double burners at intersections, and single ones between—in all 260 burners in 204 lanterns—and the result was highly satisfactory to the public. Petitions were sent in objecting to the extension of the arc lamp system and requesting the Welsbach instead, both on the score of economy and of efficiency.

Several speakers in the ensuing discussion, including Mr. Dickey, of Dayton, Mr. Cline, of Springfield, and Mr. Wilkiemeyer, of Evansville, testified to the success of the Welsbach system of street lighting in their respective districts, after extended trial. Mr. John Franklin, Distribution Superintendent to the Cincinnati Gas Company, exhibited a number of appliances for the better utilization of the Welsbach lamp in street lighting, including a lantern devised by himself. The principal features were a pilot igniting arrangement for use with the ordinary torch, including a sliding shutter and a three-way cock. The lamplighter opens the shutter, turns the cock half way on, which admits gas to the pilot, ignites the same, closes shutter, and then turns the cock full on, thus igniting the burner and extinguishing the pilot. There is an anti-vibrating spring arrangement, and also a needle valve for adjusting the supply of gas to the burner. He also introduced a contraction in the bunsen or air tube, which greatly improved the mixing of the gas and air before combustion, and enabled a duty of nearly 30 candles per cubic foot of gas per hour to be obtained. He used an ordinary globe to protect the mantle, but placed on the top of it an enamelled steel deflector and a mica chimney, which protected the mantle from insects and also improved the draught of air to the burner. The lantern top was of special construction, arranged to turn back on hinges. A specimen of this lantern was exhibited, also lanterns intended for outside shop lighting, &c., together with examples suitable for large interiors, such as churches or workshops. He also exhibited a special arrangement for the connections of meters, that was used in Cincinnati with very satisfactory results.

A paper on "The Present Status of Fuel Gas" was read by Mr. J. R. Lynn, of Portsmouth, O. The supplies of natural gas were being rapidly exhausted, complete failure having already occurred in some districts, and in course of time others would follow suit. Under such circumstances, the possibility of providing an artificial substitute was extremely interesting. There was no evidence of the likelihood of selling gas at a price that would permit competition with coal and solid fuels for all purposes, but they could promise a gas that would meet all domestic requirements during certain seasons of the year, and render satisfactory service for intermittent use at any time; and in considering a fuel gas for all purposes, regard must be had to the vast requirement to be met, and to the character of the competition in the form of other heating materials with which it must contend. The only gas that could surpass natural gas in efficiency was pure oil gas; and even when oil was lowest in price, and circumstances were most favourable, this gas had never proved a commercial success in competition with coal or water gas, though there were several comparatively small Pintsch plants in successful operation. As regarded water gas, although it had to a great extent replaced coal gas, recent developments did not argue well for this particular method of production; and unless some unforeseen condition should arise, a marked decline in the relative percentage of water gas might be expected. So it was out of consideration in contemplating future fuel gas enterprises. With regard to soft-coal water gas, for which much had been promised, it had proved a failure; and there was no record of an instance where the apparatus stood the result of a fair, impartial, well-conducted test. The questionable history of many schemes and bubbles of the past, accounted more than anything else for the present apathy of investors towards the promotion of fuel gas enterprises. Under present conditions, there was but one possible method of manufacturing an economical gas that would increase the present field of the market for gaseous fuel, and that was by the distillation of coal in large quantities, and the complete utilization of all bye-products. Coal gas was equal in efficiency to carburetted water gas, and could be produced more cheaply in almost any part of the country. When residuals sold readily at fair prices, the coal gas man could make an excellent showing; and even with a dull market he still possessed some advantage. So if any gas was to supply a vast fuel demand, coal gas would do it, although not capable of being sold at the same price as, or quite filling the place now occupied by, natural gas. One ton of bituminous coal under a boiler in constant operation, was in practice equivalent to 25,000 cubic feet of coal gas. As the coal cost 8s. 4d. per ton, the gas must be sold at 4d. to be equal to it in value—a figure not likely to cover the cost of distribution alone. The price for fuel gas would have to be adjusted according to the local values of coal and solid fuels. Advocates of coal gas for this purpose were neither dreamers nor promoters of shadowy schemes, but voiced honest opinions, and treated the subject rationally. The manufacture of coal gas on a large scale would admit a material decrease in the cost of production, and the large consumption per mile of main and per meter would reduce the cost of distribution; while much that is wasted in the average gas-works could be turned to profitable account. What effect a greatly increased production of residuals and bye-products would have upon their market values was a matter of speculation, but the logical conclusion was that it would result in closer competition, to the detriment of existing gas-works. Attempts were now being made towards setting great undertakings of this nature on a commercial footing; and the results would be watched with much interest. The substitution of coke-ovens for retorts had been under discussion; but this

would only be practicable in works of the first magnitude. There were 84 gas undertakings in Ohio, and they produced during the past year 3400 million cubic feet of coal gas, and 630 million cubic feet of water gas. But not more than four of them exceeded a production of 200 million cubic feet of coal gas per annum, and these alone could benefit by modern improvements to any extent. Some 800 million cubic feet of artificial gas was sold for fuel and power purposes, and the proportion so applied was increasing—many companies in the State being able, during a portion of the year, to show a day output far exceeding that of the night.

Mr. M'Donald, in opening the discussion, said that nobody would ever make gas out of coal that would be equal, heat for heat, to coal, or capable of profitable application to any purpose for which coal would be equally serviceable. But the conveniences afforded by gaseous fuel were so great that consumers did not object to pay six or eight times the cost, heat for heat, of coal. Gaseous fuel would not be used for boilers or furnaces, or even for a hall stove in use 24 hours a day; but it would be used for the cooking stoves, for heating water for baths and domestic purposes, and for gas-fires where the room was only occasionally required. The meeting of these demands alone would mean multiplying the present output of gas by 5. Mr. Doherty said that the heating power of 25,000 cubic feet of gas was equivalent only to that of 1000 lbs. of coal, of which 80 per cent. could be practically utilized. But if the gas was used in a gas-engine, and compared with the coal required to raise steam for a steam-engine of similar power, it would be found that 7000 cubic feet of gas were as good as a ton of coal. If anyone used the figures given in the paper they should first be verified, as he found that the equivalent of one ton of coal under a boiler was nearer 50,000 cubic feet of gas. Mr. Stone said he had read somewhere that 180 gallons of oil, 25,000 cubic feet of natural gas, or 35,000 cubic feet of coal gas, were equivalent in heating value to a ton of coal. The advance in price of oil had led him to make particular inquiries, and he agreed with the author that at the present price of coal, coke, and tar, within (say) a radius of 100 miles, there was no soft-coal water-gas process at present that could compete with the straight coal-gas process. General Hickenlooper said that a test had been made at Cincinnati by three independent experts; and the results entirely confirmed those arrived at by the author. Mr. M'Donald remarked that one ton of coal to 25,000 cubic feet of natural gas, or 35,000 cubic feet of coal gas, was a very generally accepted figure. Mr. Doherty said that there must be something wrong in the values usually accorded to coal and gas, or some mistakes in the tests quoted. One ton of good coal was considered to be capable of yielding 28 million B.T.U. Taking coal gas at 750 units per cubic foot—and he thought 650 units would be more accurate—25,000 cubic feet of gas only represented 18¾ million units. An efficiency of 70 per cent. could be obtained with the coal; and he doubted if over 80 per cent. could be utilized from gas. Certainly they would not get the whole of the 100 per cent. Mr. Whysall said there was no difficulty in displacing a ton of coal with about 15,000 cubic feet of natural gas.

Mr. Lynn, in replying, said that his results for coal were obtained by careful practical trial with a view of getting as much as possible for it; but he did not actually test the coal gas. He gave that the benefit of the theoretical heating value, which was rather understated by Mr. Doherty, as he found that 1 cubic foot of good coal gas would develop 750 units. Natural gas was usually credited with 1000 units; but the Ontario natural gas would not give more than about 890 units, and the gas supplied to Detroit from Ohio was only equivalent to 840 units.

"Prepayment Meters" was the subject of a paper by Mr. J. D. M'Ilhenny, of Philadelphia (Pa.). The general experience had proved this system to be a means of popularizing gas, and opening up a line of business hitherto unobtainable among small householders. Much had been heard about the usefulness of these meters in large cities; but they were as well adapted, and might be of more positive value, to a small gas undertaking than to a company that supplied millions of cubic feet per day. The first cost of the prepayment meter was regarded as an obstacle, though no one hesitated about procuring ordinary gas-meters. The extra cost of a 3-light meter was about £1 4s.; and if an annual charge of 4s. was set aside for interest, depreciation, and maintenance, which was certainly a very ample estimate, he contended it was more than covered by the saving in bad debts, cash discounts and allowances, and time spent in collection, which might be devoted to canvassing or other useful work that produced some positive result. Considerable expense was frequently incurred in pushing the use of gas-stoves; and prepayment meters, while not more costly, were of equal value as bringing in fresh business. Attention was directed to a table showing the monthly sales and cash receipts during the year 1899 in a small company having 700 meters in all. Commencing with 53 prepayment meters in January (which had increased to 86 by the end of December), the sales of gas were nearly 2¼ million cubic feet, and the cash receipts £700. He had made inquiry at another small works, having something under 1000 meters in all, and was informed that 203 prepayment meters were in use, with eminently satisfactory results to all parties concerned; and the receipts averaged £3 10s. per meter per annum. They were enabled to tap a new source of business, and also to deal effectively with troublesome customers. There had been no complaints; and the relations of the company with the prepayment users were excellent. Even in a town of 4000 inhabitants, out of a total of 700 meters, 215 were prepayment; the output being 10 million cubic feet of gas, and the price 6s. 3d. per 1000 cubic feet for light and 5s. 2d. for fuel. The company were so well pleased with the results that they had decided to extend the system. Prepayment meters were now as satisfactory in working as ordinary ones, from the mechanical point of view; and the risk of robbery from the cash-boxes had proved to be very trifling and easily dealt with. They were also well adapted for use with natural gas—the 20-light size being most suitable; and one company, having set 1000 of them, was now averaging £4 7s. 6d. yearly revenue per meter. He concluded by quoting the experiences at Tottenham (England), as lately presented by Mr. Eldridge before the Southern District Association of Gas Managers.

The Secretary introduced the discussion by reading a letter from Mr. Curtis, of Woodbury (N.J.), who, after three years' experience, had nothing but good to say of the system. He intended to enlarge the output of prepayment meters as opportunity offered. Mr. Gribbel remarked that the best proof of the success of the prepayment meter was the fact that the makers had as much as they could do in turning the meters out fast enough to fill orders. Mr. Ritter said he had 550 meters on the new system in use at Columbus for 18 months; and while he did not wish to draw any conclusions as compared with the ordinary system, he had not formed so favourable an opinion of them as was expressed in the paper. The saving in bad debts, cost of collection, &c., was quite outset, in his case, by imperfect mechanism and theft. In placing the meters, also, it was necessary to distinguish clearly between *bonâ fide* new customers and those who simply changed from the ordinary system to the new. In his experience, people who would not take gas except by the prepayment system were such poor customers as scarcely to be worth having; and his average receipts per meter had not at any time exceeded £2 10s. per annum. He did not wish to infer it was not a success, as he thought that in other circumstances and localities it would give better results. He merely mentioned a few difficulties, some of which could be remedied in the future. Mr. M'Ilhenny, in replying, said it was no use to expect too much from the prepayment system. Where natural gas was abundant, and the artificial gas was required for lighting only, it might not be a success, as the lighting business alone, with the class of people who would be likely to adopt the system, was very small. It was with people who also used the gas for fuel that the prepayment meter was making such headway. Where the gas was used for lighting only, the returns would not be better than with the ordinary meter.

THE SUPPLY OF WATER GAS IN DUBLIN.

At the Meeting of the Royal Society of Dublin last Wednesday, an interesting paper on "Recent Analyses of the Dublin Gas Supply" was read by Professor J. EMERSON REYNOLDS, M.D., F.R.S. In the course of it, he said:

Large quantities of the city gas are used for various purposes in Trinity College, and it is the practice to analyze it occasionally in the chemical laboratory in order to ascertain whether its quality is maintained. In the course of the series of analyses made during the last five months, I detected a marked change in composition, which began in February and continues to the present time. This change indicated that plain coal gas was no longer supplied, but that a mixture which includes a considerable proportion of water gas has since been delivered. On the 12th of March, I drew attention to this change, in the course of a lecture delivered in the College on that date. Extracts from that lecture appeared in the daily papers, and led to considerable discussion, in the course of which opinions were attributed to me as to the probable effects of the change, which I did not express. I therefore desire in this paper to place on record the analyses made, and to shortly state the related facts which should influence opinion as to possible danger attending the public use of mixtures of coal and water gas.

Twelve analyses of the Dublin gas, performed between the 25th of November, 1899, and the 16th of January, 1900, showed that it contained, on an average, 6·2 per cent. of carbonic oxide; and a series of analyses performed since showed a great increase in the proportion. On Feb. 22 the percentage was 7·2; on Feb. 27, 8·6; on March 1, 8·7; on March 3, 8·5; on March 6, 10·8; on March 7, 12·6; on March 8, 11·2; on March 9, 17·9; and on March 10, 10·6. Apart from minor variations, to which I shall not further refer, the significant difference in the series is the increase in the percentage of carbon monoxide found in the specimens examined. The first series of analyses prove that the ordinary coal-gas supply to Dublin during nearly three months contained, on an average, 6·2 per cent. of carbon monoxide; the second series, that there had been a gradual rise in the proportion of carbon monoxide until it had doubled on the 7th of March, while two days later it had nearly trebled—17·9. It then fell away, and subsequently rose again to 16 per cent. in March. So great a change could, practically, only be due to the addition of water gas. When the trend of the results became clear, I communicated with the Gas Company in the first instance, and they admitted that a proportion of carburetted water gas had been mixed with the coal gas.

Members of the Society are well aware that what is technically known as water gas is produced by passing steam over red-hot coke, when the following change occurs: $H_2O + C = CO + H_2$. That is to say, the carbon in the form of coke, when sufficiently heated, removes the oxygen from the water vapour, and produces therewith carbon monoxide gas, while hydrogen is set free. The mixture of combustible gases so obtained gives a very slightly luminous flame and has little odour. When petroleum or other oils are vaporized at a sufficiently high temperature in this gas, their products render the flame much more luminous, and communicate a strong odour. The product is carburetted water-gas, and it contains about 30 per cent. of carbon monoxide; the rest consisting of hydrogen and small proportions of its carbides. This gas is much cheaper than coal gas; it is more readily and quickly manufactured; and its production enables a gas company to use up to advantage a considerable proportion of their coke. Moreover, it can be easily made of almost any desired illuminating power, and is not more explosive with air than plain coal gas. It is therefore much to the interest of the Dublin Company to mix a considerable proportion of this water gas in their supply. Such mixtures have been used in the United States since 1878, and to a much smaller extent in this country since 1891. Some American cities, such as Boston, New York, and Chicago, burn almost unmixed water gas. But in the United Kingdom comparatively few towns as yet use a mixture; and in those which do, 50 per cent. of water gas is seldom exceeded. In London, very little has been used; and several companies have not distributed any.

There does not seem to be any statutory difficulty in the way of the gas companies substituting water gas for coal gas; and there would not be any general objection to their doing so, provided there was no greater risk to health and life than with ordinary coal gas. But that such danger does exist is beyond question, as carbonic oxide gas is a powerful and direct poison. A gaseous mixture which contains much of it, as Dublin gas now does, is necessarily more poisonous than the ordinary coal gas, which seldom included more than 6 per cent. Therefore, in the lecture already referred to, I said only so much by way of warning, and added: "I do not want you to suppose that there is ground for undue alarm, or that the addition of water gas to coal gas is not legitimate. I think, however, that the fact of so material a change in the nature of the supply should have been notified to all consumers, in order that they might be on their guard against escape of the new gas from any causes." I do not think it would be possible to draw attention to a serious matter of the kind in milder terms than these; and no others were used by me. Nevertheless, at a recent general meeting of the Alliance Gas Company, the Managing-Director is reported to have said that the question was brought forward to create a "scare." It is therefore desirable to deal with the question of the danger to health and life which attends the use of the mixed gas more fully than I considered desirable in the first instance.

An important report of a strong Departmental Committee, appointed by the Home Office, was issued last year on the manufacture and use of water gas and other gases containing large proportion of carbonic oxide. This Committee examined a number of gas managers, as well as medical and other experts; and, after taking evidence, which was obtained from America as well as the United Kingdom, requested a distinguished member —Dr. J. S. Haldane, F.R.S.—to draw up a digest of the evidence affecting the poisonous action of carbonic oxide mixtures, and to make independent experiments in order to clear up some doubtful points. This important digest forms the chief of the several appendices to the report of the Committee; and the results arrived at represent the grounds upon which much of the report has been based. Anyone desiring to correctly estimate the value of the conclusions expressed in the general report should therefore refer to Dr. Haldane's excellent statement; but it is sufficient for my purpose to cite the conclusions which affect the question with which I am concerned. The report states that "the poisonous action of coal gas and water gas is due solely to the carbonic oxide which they contain," and that "the higher the proportion of carbonic oxide, the greater is the poisonous property of the gas;" that further, "given equal conditions as to size of room [in which an escape occurs], flow of gas, length of exposure, &c., the danger to life from an escape of carburetted water gas, or of coal gas mixed with any considerable proportion of water gas, is far greater than that from an escape of ordinary coal gas. The danger, in fact, increases at a much greater ratio than the proportion of carbonic oxide." This deliberate statement by the Committee of well-ascertained facts disposes once for all of the assertions made by interested and unskilled persons that the water-gas mixture is not more poisonous than ordinary coal gas. Carbon monoxide is well known to act as a poison by forming a strong compound with the hæmoglobin of the blood, and so preventing the absorption of oxygen from the air which is necessary for the maintenance of life. So strongly is the carbonic oxide held by the blood, that it is desirable to resort to inhalation of pure oxygen in cases of partial poisoning by it. According to Dr. Haldane's report, air containing anything more than 0·2 per cent., or 2 parts per 1000, ought to be regarded as entailing risk to life. Half a part per 1000 is still capable of causing, even in healthy persons, giddiness and headache. Dr. Haldane adds: "The after-symptoms of carbonic oxide poisoning are often of a very serious nature;" and he then details the character of the symptoms.

It has recently been asserted by gas managers and others that the water-gas mixture has not caused more accidental or other deaths than plain coal gas. This is not the opinion of the Committee. Taking the case of Boston, they point out that in 1886, when there were 29,554 consumers using plain coal gas, no accidents were recorded. In 1890, there were 46,848 consumers of a gas supply of which only 8 per cent. was water gas, "and there were six deaths from gas poisoning." In 1895, the number of consumers reached 68,214, and 90 per cent. of the supply was water gas, and 24 deaths occurred. In 1897, the consumers numbered 79,893, the gas contained 93 per cent. of water gas, and there were 45 deaths. After discussing the cases of other towns, the Committee go on to say: "After making every other due allowance, we feel that the state of affairs disclosed in Boston, New York, San Francisco, and other towns, is decidedly serious." Dr. Haldane points out that the number of accidents by the use of the mixed gas increases approximately as the cube of the gain in percentage of carbon monoxide. Thus, if the percentage of carbon monoxide be increased from 6 to 18, the probable cases of poisoning would be 27 times greater. "This rule," he says, "would seem to be borne out in the case of Toronto; and, so far as it is possible to judge from the very partial information available in the case of towns in the United Kingdom distributing any water gas, experience in this country also points in the same direction."

The author concluded by referring to some of the recommendations of the Committee; among others to those referring to the present use of imperfect gas-fittings, and the advisability of conferring upon a Central Department power to "make regulations, enforceable by adequate penalties, limiting the proportion of carbonic oxide in the public gas supply at night to 12 per cent., or such greater amount as the Department may consider desirable."

Professor Cole, who presided, in inviting discussion on the paper, remarked that Professor Reynolds had, by bringing the subject under the notice of the Society, placed it in a scientific arena, and had freed himself of the charge of personal bias.

Professor Tichborne (Official Gas Examiner for Dublin) said, with regard to the statement about the scare, he was quite sure that Professor Reynolds did not wish to create one. But some little alarm had evidently been caused by the extraordinary statement made in the House of Commons that the high death-rate of Dublin was due to the manufacture of water gas. The highest death-rate of the city was during the first and second weeks of January, when it was 51·3 and 51·9 respectively. The average for January was 47·1; for February, 41; for March, 37·5; and for April, 33·1. So that there had been a steady and gradual diminution from the first week of January; and he hoped it would continue. Though the highest death-rate was during the first and second weeks of January, he was officially informed that the first carburetted water gas was sent into Dublin on the 6th of February. These statistics showed that there could be no connection between the high death-rate and the supply of water gas. If there were any, the more water gas they had the better, because the death-rate had steadily declined since its introduction. He did not see any necessity for supplying carburetted water gas at night. The gas possessed certain advantages over ordinary coal gas. It had a higher illuminating power, it could be produced more quickly, and the products of its combustion were much purer. He would take the liberty of reading an extract from the report of the Departmental Committee to which Professor Reynolds had referred:—

> In the daytime, however, the amount of carbonic oxide is not of serious consequences. An escape of carburetted water gas is as easily detected as one of coal gas, and, except in very special circumstances, can be avoided or remedied long before the atmosphere is in the least degree poisonous. Even at night very slight escapes of an ordinary character, caused, for instance, by imperfections in the joints of fittings, do not appear to us to be rendered more formidable by the introduction of carburetted water gas. It is practically impossible for a really poisonous atmosphere to be produced by such escapes; and though it is evident that constant exposure to small leakages of gas may be to some degree prejudicial to health, we do not think that the existence of anything like chronic poisoning by carbonic oxide has been established.

He might say that cities like London, Manchester, and Belfast were being supplied with the gas, and, in fact, Dublin was behind the times in the employment of it. He had made careful inquiry at the Dublin Hospitals, and had learned that there had not been any accident from this gas during the past three months. He had been told that there had been several from electric currents; but nothing very serious. He could not trace any deaths from this cause, though two or three cases had been taken to hospital. And he was further informed that a very large proportion of the burns sustained, especially by children, arose from the use of oil-lamps.

Dr. C. F. Moore said he had been called to two cases of accident from water gas. In one of them, a man seemed to have only put his nose into the receptacle for the gas, and he was dead and perfectly cold when discovered shortly afterwards. In connection with the factories of Dublin, he had very great reason to apprehend the danger arising from the more deleterious composition of the gas burnt. There were a great many places in which gas-engines were employed, and where a large amount of inevitable escape of gas took place therefrom. Water gas had a greater specific gravity than coal gas, and therefore it took a longer time to clear away after an escape. For this reason, the

danger of an explosion when a light was brought into contact with it was increased. A large number of people were engaged in these works where gas-engines were used; and therefore he thought it was very important that such a paper as that of Professor Reynolds should be made public in Dublin.

Mr. JOHN R. WIGHAM remarked that Professor Reynolds seemed to have been particularly guarded and careful in his statements, and said he thought the effect of the paper would be to do away with the slightest feeling that there need be any scare in connection with the matter. Professor Reynolds had told them that carbon monoxide gas was poisonous. Nobody doubted this for a moment. The extracts which he read from the report of the Departmental Committee tended, not to alarm, but to soothe the public mind, and to reassure the people as to the use of water gas. The Committee recommended that there should never be a greater proportion of carbon monoxide than 12 per cent. He thought it would be found that the average of the figures which Professor Reynolds had quoted dealing with the percentages of carbonic oxide in Dublin gas was not more than 12 per cent. If people supposed that the present gas supply of Dublin was particularly dangerous, he thought they were labouring under a very great mistake. Nobody should know more about the poisonous nature of the mixture than the people in the works where the gas was made. Some of those present who were connected with the Gas Company knew perfectly well that there was not the least danger, and that not the slightest accident had occurred through the gas from first to last. If there was the possibility of people being so suddenly killed by the gas, were not those employed at the works most exposed? It was true they were supposed to be skilled persons; yet in the manufacture of the gas there was the possibility of getting a puff of it in the face. Such things had happened, and no inconvenience had resulted, as far as he knew. He did not mean to say that the truth should be suppressed in any way. One great thing about water gas was that if it was poisonous it was also exceedingly pungent. If a man or a woman went to sleep in a room in which the fireplace and windows were closed, unless he or she were under some disability, from having taken drink or some such cause, the gas was so pungent that it would awake the person before it could do harm. [Professor Reynolds dissented.] Well, he (Mr. Wigham) was quite familiar with its peculiar smell. It was by no means similar to that of ordinary gas. It had a much more disagreeable odour; and the fact of its having this odour was an evidence of its safety. As to Professor Reynolds's criticism of the Gas Company for not having given the public notice of the change, he (Mr. Wigham) did not think they were called upon to do so. The Company was a creature of the law. They made their gas and supplied it to the public under certain legal restrictions; and he did not see that they were called upon to say to the public, who did not understand these things: "Look out, because we have made a new kind of gas." He thought this would be a foolish thing. The Company knew they were making a change which would only be perceptible to an expert; and he thought it would be an exceedingly dangerous thing to have created a public panic upon such a subject. Professor Reynolds's opinion was looked up to in all quarters; and they should expect him to quiet down any needless alarm, and not in any way to accentuate it.

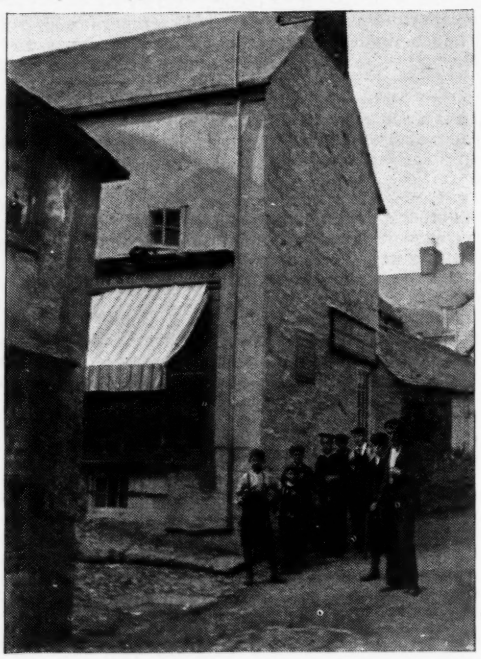
After some further discussion,

Professor REYNOLDS replied to the remarks of the various speakers. Referring to the point urged that no accidents had occurred, he said he presumed the public read the newspapers, and that, therefore, they had received warning of the change in the composition of the gas, though the warning had not come from the Gas Company.

The Cost of Introducing the Metric System.—This subject was dealt with in the April number of "Cassier's Magazine." It is pointed out that more than twenty years ago, in a report on the subject, made to the Franklin Institute by Dr. Coleman Sellers and the late Mr. W. P. Tatham, it was stated that, according to calculation, in a well-regulated machine-shop, thoroughly prepared for doing miscellaneous work, employing 250 workmen, the cost of a new outfit, adapted to new measures, would not be less than £30,000, or £120 per man. If new weights and measures were to be adopted, so the report continued, all the scale-beams in the country would have to be regraduated and re-adjusted; the thousands of tons of brass weights, the myriads of gallon, quart, and pint measures, and of bushel, half bushel, and peck measures, and every measuring rule and rod throughout the land, would have to be thrown aside, and others, which the common mind cannot estimate, substituted. The great mass of English technical literature would become almost useless, and would have to be translated from a language which we, and the nation we have most to do with, understand perfectly, into a new tongue, which is strange to most of our people. As a question of cost, let those who advocate this change consider it carefully. Altogether, the ultimate benefits of the change proposed would be of less value than the damages during the transition. Those who choose to do so can use the metric system, and no one can object to it; but, for the Government to require its people to use that, and no other, would be an abitrary measure which they would be neither willing nor able to bear.

THE DISCOVERY OF COAL GAS.

We have received from the Rev. E. Ambrose Couch, of Bridgwater, a print of a photograph which he has taken of the house at Redruth in which Murdoch, the inventor of gas lighting, lived from 1782 to 1798; and we reproduce it, accompanied by



a few notes on the subject of Murdoch which Mr. Couch has been good enough to prepare. Of course, many of these particulars are known to the majority of our readers; but it will no doubt be interesting to have the details from the pen of a non-technical writer. Mr. Couch says:—

Though gas lighting is to-day the popular mode of illumination, there are, perhaps, but few people who are aware where, when, and by whom coal gas was first discovered and first burnt. So rapid has been the development in the procuring of artificial light, that there are people alive to-day who can remember that, at one time, the quickest way of obtaining a light was by spending many precious minutes in trying to strike a spark of fire from a flint—allowing it to drop into a box containing tinder composed of charred linen or cotton rags. This small spark had then to be gently heated and fanned, until it became of sufficient strength to ignite a brimstone match when applied to it. It was in this tedious way that our fathers obtained light in the "good old days." Great was the need, in those times, of that most excellent virtue, patience—and especially if it should happen that the tinder in the box got wet during the night; for in that case there was nothing for our fathers to do but to wait till the return of natural light. In 1827, however, there was invented a match which ignited by friction, though it did not come into general use for many years. In these times, the "rush-light," which gave the faintest glimmer amid surrounding darkness, was the only mode of illumination known in many a home. The rush-light was succeeded by candles and the snuffers—giving trouble and an offensive smell of which many to-day are ignorant. Then there came the various stages of oil-lamps—at first burning animal-fats and oils expressed from the bodies of fish, and afterwards mineral oils such as paraffin and benzoline.

It was not till the close of the eighteenth century that the world became acquainted with that kind of lighting which is now so popular—coal gas. The person to whom this great and really beneficial discovery is due—a discovery which completely revolutionized the then existing modes of illumination—was William Murdoch. A native of Old Cumnock, in Ayrshire, he was sent by the firm of Boulton and Watt, Engineers, of Birmingham, to superintend the erection and fitting of their steam-engines in the noted Cornish mines. It was while he was in the county of Cornwall that he made a number of experiments on gases for the purposes of illumination; and the house depicted in the accompanying photograph, situated in Redruth, is the identical house where William Murdoch discovered coal gas, and applied it to practical use in the lighting of it, in the year 1792. The small iron plate affixed to the end of the house (as shown in the photo) bears the following inscription.

WILLIAM MURDOCH
LIVED IN THIS HOUSE
1782—1798.
MADE HIS FIRST LOCOMOTIVE
HERE AND TESTED IT IN 1784.
INVENTED GAS LIGHTING AND
USED IT IN THIS HOUSE 1792.

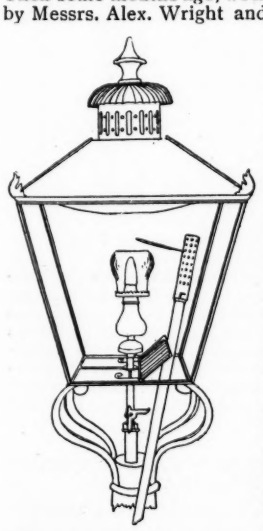
William Murdoch continued his investigation, and brought

this new light into public notice in the year 1802. It was in that year that the peace of Amiens was declared; and in commemoration of the event, the whole front of Boulton and Watt's Soho Foundry, in Birmingham, was lit up with gas. A contemporary writer thus describes it: "The whole front of the extensive range of buildings was ornamented with a great variety of devices that admirably displayed many of the varied forms of which gas-light is susceptible. The luminous spectacle was as novel as it was astonishing; and Birmingham poured forth its numerous population to gaze at it." Murdoch did not patent his invention, and gas was brought to the notice of London in the year 1803. In 1805 Pall Mall was lit up with it; and in 1810 a Company was formed, under Act of Parliament, for the manufacture and supply of the new illuminant in a district of London. The lighting of the whole of London quickly followed; and "the time had arrived when men were to see the capital all the year round from dusk to dawn, blazing with a splendour beside which the illumination for La Hague and Blenheim would have looked pale." This was but the prelude to its universal adoption—first in England, then in other countries of the world—as seen at the present day.

THE EXPENSE OF THE PILOT: A NEW TORCH FOR INCANDESCENT LAMPS.

There has been quite an awakening of interest lately, through the appeals of various new devices, in the question of the method of igniting street incandescent gas-lamps. It is recognized that, in order to promote the extension of the incandescent system, and the better to enable it to compete with the electric light, the cost must be brought as low as possible consistent with good illumination. One direction in which it has been thought retrenchment might be effected has been in the "dropping of the pilot." It cannot be denied that the constantly burning bye-pass involves an expenditure of gas which, even in a moderate installation of street-lamps, forms an appreciable annual charge. Readers of the paper by Mr. J. H. Sheldrake which we published last week, had this brought home to them in a striking little calculation which he made. With gas at 3s. per 1000 cubic feet, he showed that the consumption of gas by a street-lamp bye-pass would represent a cost of 5s. 3d. per annum; and multiplying this by the number of lamps in use, or proposed to be adopted, it will be seen that there is an expenditure which is worth saving. In fact, the annual expense of maintaining the bye-pass, taking Mr. Sheldrake's figures, is actually about equal to the cost of the number of mantles which engineers experienced in this system of lighting say are required per annum to ensure efficient street lighting. Therefore, on this point alone, the question of doing away with the flash-light is worth serious attention. But beyond this, the pilot is charged by lighting engineers with reprehensible conduct, which augments the cost of maintenance and labour. It frequently blackens the mantles, and causes them, particularly in cold weather, to fracture by heating them unevenly. In inclement weather, too, it has the bad habit of going out; and in cold seasons complaints are made of the supply-tube becoming stopped up, and so causing the extinction of the jet. This cessation of duty on the part of the pilot, delays the lamplighter who has either to indulge in the undignified action of climbing the lamp-post, or must fetch a ladder to re-start the delinquent.

The constant cost and these annoying failures have suggested various other expedients for performing the same service. There have been the self-igniting arrangements, which, for street-lighting purposes do not appear so far to have "taken on" to any extent. Then some months ago, we noticed a patented device introduced by Messrs. Alex. Wright and Co., by which the ordinary torch could be employed. It consisted of a special form of cock, and a bye-pass in one corner of the lantern, which, on being ignited by the torch, threw over the top of the mantle a long thin flame. This was ingenious; but there has been an improvement upon it which rather takes our fancy, though some engineers may prefer the original form. With the new invention, no special form of cock or bye-pass of any kind is required; all that is necessary for the safe and sure lighting of incandescent lamps being contained in the torch itself, which is simple in construction, easy to handle, and suitable alike for flat-flame or incandescent burners. On inserting the torch in the lantern, the lamplighter can, by merely a slight pressure on an india-rubber bulb in the handle, project a flame some inches in length over the top of the mantle, while keeping the torch as far from the latter as the dimensions of the lantern will allow. There is nothing more difficult about it than there is in the ordinary torch to which the lamplighter is accustomed. The means by which the jet of flame is secured are these: In a groove in the handle of an ordinary torch, a small tube is inserted, at the lower end of which is the india-rubber bulb already mentioned. The tube terminates at the head of the torch in a small reservoir containing benzoline (perhaps ½ oz.), and upon this reservoir fits the ordinary colza oil container and torch head. Through this, however, passes a small tube, terminating at the side of the flame, and bent over it at about right angles. The colza oil burner being alight, and pressure being applied to the rubber bulb, a small amount of benzoline vapour is sent up the tube, lighting at the colza flame, and shooting out at right angles (as shown in the illustration). In addition to its main purpose, the flame, being luminous, will be found useful to the lamplighter in performing his duties on dark nights. The torch, being fitted with a hook, can also be used for turning on the cocks of lanterns already fitted with permanent bye-passes.

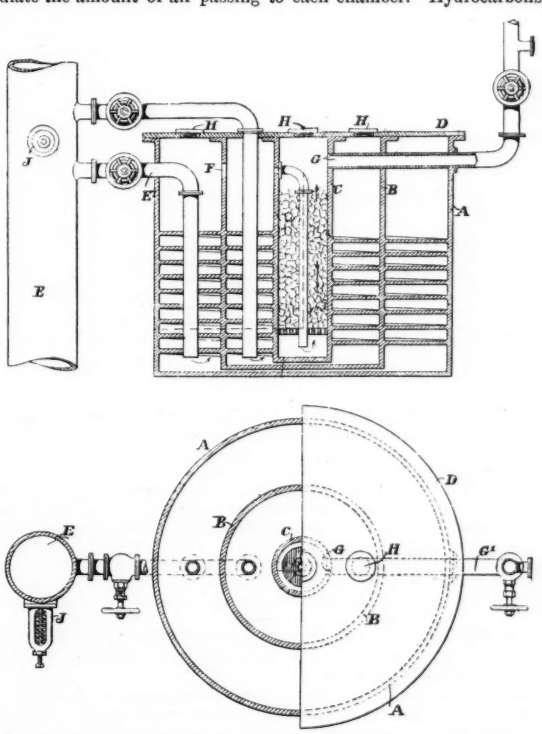


Of course, the great point to be considered is whether there is any liability of injury to the mantles by using an arrangement of this kind. Seeing that the torch is inserted through a lighting frame, which shuts down quite sound, and which has a stop upon it to keep the torch some inches from the burner or glass, and that a flame can be projected several inches, there does not seem any possibility of damage to the mantle being occasioned by its use. There is a notion abroad that the action of this torch is similar to that of a blow-pipe. This is a mistake; the description we have given showing clearly that it does not rely upon the force of air to divert the flame horizontally. More might be written regarding the patentees' claims as to savings in capital and economies in other directions which even this simple torch may effect in connection with incandescent street-lamps; but they will be patent to gas engineers. Messrs. Alex. Wright and Co. inform us that it is not their intention to make a charge for the torch; but to supply and maintain it free—making a moderate annual charge per lamp lighted, varying with the extent of the installation. This charge, it is said, will only be a trifle compared with the savings that will be effected by the use of the torch.

REGISTER OF PATENTS.

Manufacture of Gas for Lighting and Heating.—Hodder, A. E., and Lester, J. B. G., of Queen Victoria Street, E.C. No. 10,439; May 17, 1899.

This invention comprises the provision of a power-station from which air is forced along mains through the district to be illuminated; and from the mains branch-pipes would be led to the various installations in the system. The generator provided at each installation comprises two or more concentric annular carburetting chambers, each connected to the air-supply main by a conduit provided with means to independently regulate the amount of air passing to each chamber. Hydrocarbons of



different specific gravities are employed—separate from each other; each being allotted its own chamber. In this way, "the proportion of carburetted air obtainable from each chamber can be adjusted so that the gas resulting from the mixture of these carburetted streams may have any quality or richness desired."

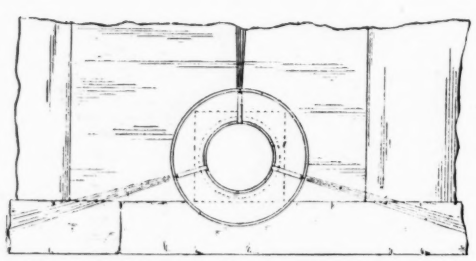
When working the apparatus, the outer chambers are partially filled—one with a light hydrocarbon such as petroleum ether or benzene, and the other with a heavy hydrocarbon such as petroleum, having a flash

point at or about 120° Fahr. The central chamber is filled with naphthalene (albo-carbon), resting on the false bottom. By means of the valves, air is admitted to the chambers, and passes up through the hydrocarbon in each—being forced to take a helical passage through them by means of the spiral blades or vanes. The air thus carburetted passes from each chamber into the space below the perforated partition in the central chamber. Here the carburetted air from the two chambers becomes mixed, which mixing is further effected by its passage through the perforated bottom. In the central chamber the carburetted air is further enriched by the naphthalene; and the gas thus formed is carried off through the orifice G for consumption.

The generator shown comprises an outer cylindrical vessel A, having arranged within it a second vessel B; and within the vessel B is a third vessel C. The lower part of each outer chamber thus formed is provided with spiral blades or vanes; and the lower part of the central chamber is provided with a perforated partition or false bottom. All three chambers are closed above by a plate D. A main-pipe E communicates with a central pumping-station, from which it receives a continuous supply of air under pressure; and communicating with it are branch-pipes entering the outer chambers at their upper ends, and extending down to within a short distance of the floor of each. The upper ends of the chambers are in constant communication with one another by passages F; and both chambers communicate with the central chamber by an orifice preferably in the upper end of the chamber and a dip pipe within the chamber, which extends down, through the perforated partition, to within a short distance of the floor of the chamber. At the upper end of the chamber is a second orifice G. Each of the chambers has a screw-plug H; and the pipe E is provided with a loaded relief-valve J.

Street Gas-Lamps.—Livesey, G., of Old Kent Road, S.E. No. 11,431; June 1, 1899.

The object of this invention is "to construct a framed lantern for incandescent gas street-lamps, in such a way that the shadows which must necessarily be produced, shall so fall as to constitute the least possible source of danger." To this end, the lantern is made circular, and the frame is formed with three bars or uprights, arranged so that no shadow will be thrown across the road, nor parallel with the curb—see the accompanying elevation of the lantern and a plan view, with the top removed, and showing also the pavement.



One of the bars of the lantern is at the back, and the other two bars at equal distances from the back bar, but in such a position that the shadows will cross the curb at an acute angle, as near to the lamp as possible. To illustrate more practically the position of the side-bars, says the patentee, let it be supposed that the distance between the back and the two side-bars, measured on the circumference of the circle, equals, in each case (say), 4, then the distance between the two side-bars, measured round the front of the lantern, will equal (say) 5½. By this means, it is claimed that a good, clear (that is, without shadows), and extended front to the lamp facing the roadway is obtained; while the shadows, which must necessarily be produced, will be in the best position to obviate danger.

Igniters for Gas.—Friedeberger, L., and the "Vulkan" Gesellschaft für Selbstzündende Glühkörper mit Beschränkter Haftung, of Berlin. No. 16,056; Aug. 5, 1899.

This invention relates to a process for "the preparation of igniters for gas, by heating a mixture of salts of platinum with refractory oxides or salts producing such—characterized by the employment of chlorides of the platinum group in combination with cyanogen salts of the platinum group in the presence of a refractory acid or a compound yielding the same on heating."

Both the cyanides and the chlorides may be used either in the form of uncompounded or compounded or composite salts. Examples of the latter are, for instance:—

A.—Cyanide of barium and platinum ($BaPtCy_4 + 4H_2O$); cyanide of magnesium and platinum ($2MgPtCy_4 + 7H_2O$); cyanide of ammonium and platinum ($(NH_4)_2PtCy_4 + 2H_2O$); cyanide of zinc, platinum, and ammonium ($ZnPtCy_4 + 2NH_4 + H_2O$); cyanide of thorium and platinum ($ThPt_2Cy_8 + 16H_2O$); and the like; or corresponding cyanides of the other metals of the platinum group.

B.—Chloride of thorium and platinum ($PtCl_4 + ThCl_4 + 12H_2O$); chloride of magnesium and platinum; chloride of ammonium and platinum ($PtCl_4 + 2NH_4Cl$); and the like; or corresponding chlorides of the other metals of the platinum group.

As refractory oxides, all oxides of the alkaline earthy metals and the earthy metals may be used in the form of such salts as are decomposable by heat—as, for instance, nitrate of thorium, nitrate of magnesium, nitrate of zinc, and the like.

As chlorine-expelling agents, may be used—silicic acid, hydrofluoric acid, fluosilicic acid, boric acid, phosphoric acid, and the like, either as such or in the form of decomposable compounds, such as alkaline silicates, chloride of silicon, organic silicon compounds, soluble borates, soluble phosphates, and the like.

The patentees prefer to use, as most advantageous: Platinic chloride—that is to say, hydrogen platinum chloride ($H_2PtCl_6 + 6H_2O$), together with the double cyanide of barium and platinum ($BaPtCy_4 + 4H_2O$) as the metal-yielding component, and nitrate of thorium as the refractory oxide-yielding component, in combination with silicic acid as the chlorine-expelling component. The employment of silicic acid, they say, has, in addition to its very energetic expelling action on the chlorine, the important technical advantage that it enables, by means of the impregnation method usual in the manufacture of incandescent mantles, shaped igniters to be manufactured, in which a large surface is combined with great resisting power to shocks, and permanence of shape.

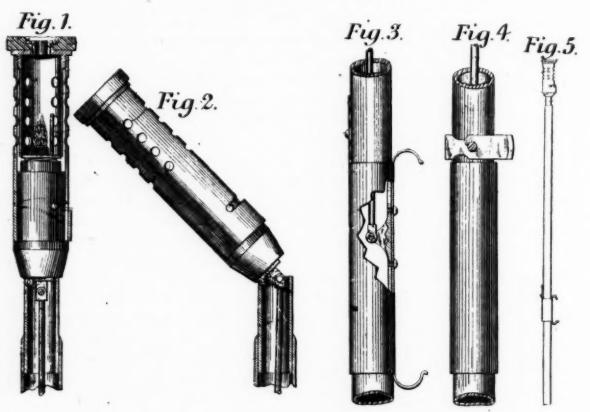
In carrying out the invention "in its most perfect form known," they suggest proceeding as follows: A fabric of cotton, wool, silk, asbestos, or the like, is first impregnated with a solution of water-glass (soluble silicate of potassium or sodium); and, after cautious drying, it is treated with a mineral acid, preferably hydrochloric acid, whereby the alkaline silicate is decomposed, and its silicic acid caused to remain behind in the gelatinous state. The silicified fabric is then impregnated with a watery solution containing 25 parts of hydrogen platinum chloride, platinic chloride ($H_2PtCl_6 + 6H_2O$), 6 parts of double cyanide of barium and platinum ($BaPtCy_4 + 4H_2O$), 19 parts of nitrate of thorium, and 50 parts water. After drying, the impregnated silicified fabric is cut into pieces of desired size and form, which are exposed to the action of heat so as to reduce the thorium nitrate to thoria, and the platinum salts to platinum. Thus "a withstanding refractory structure is obtained, intermingled with extremely fine particles of platinum."

The igniter thus produced will "not only ignite the gas with certainty in any state of the weather, but maintains its igniting capacity for a very long time."

Lighting-Torches for Incandescent Lamps.—Foulger, G. F. L., of Clapton, and Glover, J. G., of Clerkenwell. No. 22,625; Nov. 13, 1899.

This invention (in the words of the patentees) is "chiefly intended for lighting street and like gas-lamps or lanterns, in which incandescent mantles or the like are used, and enables the pilot or side light to be dispensed with, and the ordinary oil or spirit torch to be employed as at present."

For this purpose, the torch proper is made with a hinge, so that the upper or flame portion can be canted over the uprising gas, by the action of a rod with which the handle of the torch is provided, after the torch has been inserted into the body of the lamp. The canting is to such an extent that the gas-flame is lighted either through the small quantity passing through the mesh of the mantle fabric, or by the torch being canted over the top outlet of the mantle for lighting the gas from above—this being determined more or less by the height of the chimney, if one be used.



The arrangement referred to will be clearly understood from the illustration. Fig. 1 is a section of the upper part of the torch for ordinary lighting purposes. Fig. 2 is an exterior elevation with the head canted for incandescent lighting purposes. Fig. 3 is a part sectional elevation of the handle portion of the torch-stick, with the sliding ferrule and retainer appliance. Fig. 4 is an elevation of the handle part of the torch-stick with a sliding ferrule and the retainer appliance reversed, or thrown out of action. Fig. 5 is an elevation (on a reduced scale) of the torch and stick complete.

Lighting Street and Other Lamps.—Foulger, G. F. L., of Clapton, and Glover, J. G., of Clerkenwell. No. 23,082; Nov. 20, 1899.

This invention consists of an oil or spirit container and a wick-tube for a fixed flame, and a spirit container from which (by a current of compressed air) the spirit "becomes atomized and forced through, or within

range of and from, the fixed flame; the air being passed through a tube connected with a hand bulb or other compressor to a distance from the fixed flame."

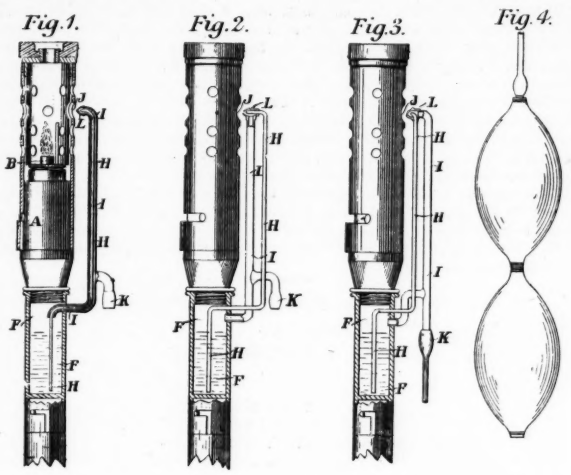


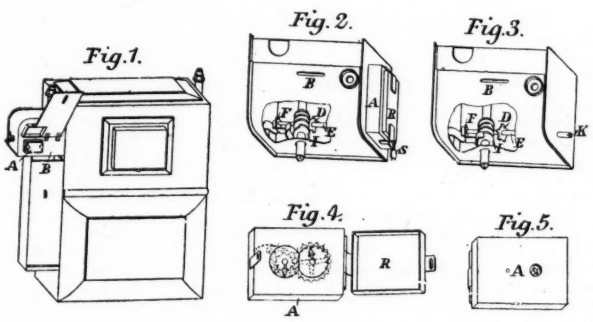
Fig. 1 is a sectional elevation of a torch-head, with the air-supply pipe encircling the spirit or oil supply-pipe. Fig. 2 is a part sectional elevation of a torch-head with the air-supply and spirit or oil supply-pipes connected at the top only. Fig. 3 is a part sectional elevation of a torch-head similar to fig. 2, but with the oil or spirit and the air supply-pipes differently arranged. Fig. 4 is an elevation of the air compressor or pump (of the usual construction).

The oil or spirit container A is secured to a spirit-container F; and pipes H I are arranged in connection with the spirit-container leading to a hole J in proximity to the fixed flame of the burner B. A branch K from the pipe I is in connection with a bulb or compressor (fig. 4), at a distance from the fixed flame; so that by compressing it, air is forced into the pipe I, and acting upon the spirit in the container forces it up the pipe H to the nozzle L, where it is met by another current of air from the pipe I, becomes atomized, and is forced through the hole in the torch-head and out of the corresponding hole on the other side. In doing so, it becomes ignited by the fixed flame, and issues from outside the torch-head—the size and volume of flame being determined by the amount of action on the compressor.

Checking Apparatus for Coin-Freed Gas-Meters.—Pipersberg, H, of Luttringhausen, Germany. No. 25,756; Dec. 30, 1899.

This invention consists in connecting a coin-freed gas-meter with a closed removable tell-tale, which registers the introduction of coins, is removed by the inspector, when the money is taken out, and opened in the office for the purpose of checking the amount paid in.

Fig. 1 shows the tell-tale A, in connection with the box B for the introduction of the money, attached to the gas-meter. Figs. 2 and 3 represent the coupling of the tell-tale with the rest of the working mechanism. Figs. 4 and 5 illustrate the removed tell-tale.



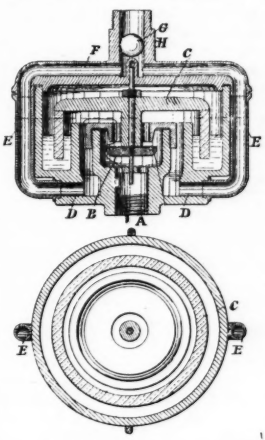
On a spindle, which, after insertion of a coin, must be rotated once by means of a crank handle in order to release the right quantity of gas, a worm is arranged, which acts on a tooth-wheel D, mounted on the indicator spindle E, which is arranged at right angles to the other spindle. The spindle E, which connects the tell-tale A and the indicating working mechanism of the meter, is displaceable longitudinally, and at F is under the influence of a spring which, as long as the tell-tale is not connected with the meter, presses the shaft out of the working position (fig. 3) in such a manner that the contact between the worm-screw and the tooth-wheel is broken. The spring simultaneously presses against a pawl, which engages with a notched disc I mounted on the first-named spindle; so that the rotation of the spindle is also prevented so long as the tell-tale is not connected with the meter.

The shaft E, which is carried through the side of the box B for the introduction of money, is furnished at its free end with a cleft K for the reception of an indicator-pin; so that, when the tell-tale is mounted, the pin is firmly connected with the shaft, and transmits the number of rotations to the indicating mechanism of the tell-tale. This consists of a dial-plate, cam-wheel, ratchet-wheel, and pawl. The tell-tale is closed by means of the cover R and the connected lead-piece S; and after the tell-tale has been placed on the box into which the coins are dropped, the whole apparatus is closed by means of a folding cover with the assistance of a lead-piece.

The operation of the tell-tale is as follows: The indicator-pin having been inserted in the cleft K of the shaft E, the cover is closed, and at the same time displaces the spindle against the action of the spring, bringing it into the working position, so that the tooth-wheel D engages with the worm. By the pressing back of the spring, the pawl is forced down simultaneously from the ratchet wheel I; so that, after a coin has been introduced, the spindle can be rotated without hindrance. The number of rotations of the spindle is now transmitted by the worm and tooth wheel D to the shaft E, and thereby to the counting mechanism of the tell-tale, in such a manner that the number of rotations of the spindle is registered on the dial-plate, and a checking of the number of times money has been put in is duly effected.

Gas Pressure-Regulators.—Hein, R., of Friedenau, Germany, and Hahn, T., of Kötzschenbroda, Saxony. No. 770; Jan. 12, 1900.

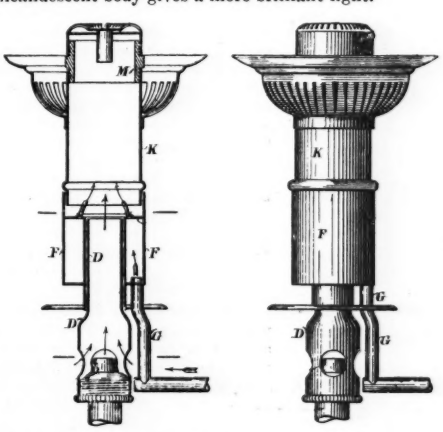
This invention relates to a gas pressure-regulator with floating bell, characterized by the fact that the upward pressure on the bell, in every position, stands always in a certain definite relationship with the pressure on a valve in connection with the bell, and under the direct action of the inlet pressure of gas; the object aimed at being to dispense with the use of special devices in connection with the valve, for the relief of pressure, when required.



As shown in the engraving, the gas enters through the opening A, and arrives under the valve B, which is in rigid connection with the bell C, dipping into the mercury. The greater the pressure of gas, so much the higher will the bell rise out of the mercury. The upward pressure upon the bell (made of light material) will now decrease; and the valve will close the admission opening for the gas more or less as the bell rises, while at the same time the pressure underneath the valve comes into more effective operation, and reaches its highest point so soon as the valve has fully closed the admission-opening. In this case, however, the upward pressure upon the bell is so small that the weight of the bell itself causes it to have a tendency to fall, and the valve again to open. By a correct choice of the wall-thickness of the bell, say the patentees, and of the material to be employed, as well as of the diameter of the valve, "the construction may be so nicely arranged that, without the use of special pressure-relieving parts, the gas will only enter the tube D under a certain determinate pressure." After passing through the latter, the gas next traverses the tubes E, and through the cover F, which is provided with passages for it; the cover being furnished with an exit-pipe H, in which a regulating-screw G works, and by the aid of which the delivery of gas is controlled.

Incandescent Gas-Burners.—Heinroth, P. and Tresenreuter, G., of Berlin. No. 3735; Feb. 26, 1900.

The patentees point out that burners as heretofore constructed for incandescent lighting (usually of the bunsen type in modified form)—produce the heat required for heating the incandescent body, by mixing together gas and air in such a manner as to cause the gas to issue from a number of small orifices into a pipe to which air has access. This mixture of gas and air burns with a blue heating flame; and, when the mixture, before being consumed, is again as intimately mixed as possible with air at low pressure, a much higher degree of heat is produced, and the incandescent body gives a more brilliant light.



The burner here consists of a nipple screwed upon the gas-supply pipe, and formed with several small orifices. Upon the nipple is fixed the mixing-tube D, having openings near its lower end, serving as air-inlets from the exterior. The gas mixes with the air, and the mixture flows upward in the direction of the arrows, and then enters a second mixing-tube K of much larger dimensions. The mixing-tube is supported upon the upper extension of a cylindrical chamber F, carried upon the first mixing-tube. The chamber is closed near the top by a plate, in which is formed a ring of small orifices. A tube G enters from below into the chamber F; and the extension of this tube leads to an air-compressing apparatus of any convenient form—for example, a pump, air-blast, or other suitable arrangement for supplying air under comparatively low pressure. The pressure, in fact, need not be more than that of the gas—say, a few millimetres of water column.

The air from the apparatus thus passes into the air-chamber F, and

then in the direction of the arrows. The orifices through which it passes are preferably drilled so as to cause the air-jets to issue in an inclined direction (as shown by the arrows), and thus impinge immediately upon the air and gas mixture ascending through the mixing-tube D. It thus becomes intimately mixed therewith; the new mixture finally flowing upwards into the mixing-tube K, and thence to the burner.

Upon the upper end of the tube K is mounted the burner-socket M—mostly made of steatite—with slits through which the mixture passes and comes in contact with the mantle carried in the ordinary manner. The mantle is "thus heated to an exceedingly high degree, even with a very moderate air pressure from the pipe G; and a light of great brilliancy is produced."

Stopping Leaky Pipe-Joints.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 1998; Jan. 31, 1900.

Fig. 1 represents a sectional view of two pipe sections connected by a thimble and having the particular repair device applied to them. Fig. 2 shows the repair device applied to a leaded joint.

The object of the inventor is to provide a repair device which can be applied to the joints of pipes for conveying gas, oil, or other fluid, to stop leaks therein, without removing the pipe or disturbing the joints in any way; and it consists of a pair of clamping-rings provided each with an annular recess to receive a packing-ring, and clamping-bolts which draw the rings together, and force the packing up against the ends of the joint.

Fig. 1.

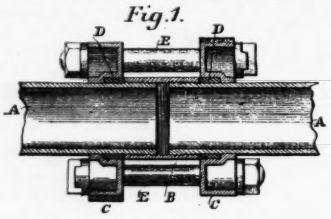
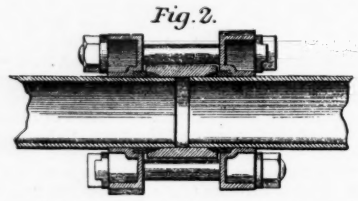


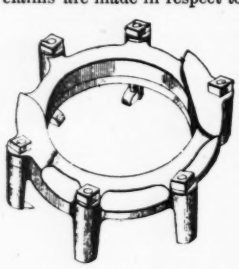
Fig. 2.

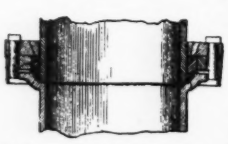


The meeting ends of the two sections of pipe A are secured together by a screw-threaded union B. C represents the clamping-rings, each of which is provided with an annular recess slightly larger in diameter than the union B, to receive a packing-ring D; and E represents the clamping-bolts for drawing the clamping-rings together—clamping the packing rings against the ends of the union B, and compressing them between the ends of the union and the bottom and sides of the recesses.

Stopping Leaky Joints in Gas and other Pipes.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 1996; Jan. 31, 1900.

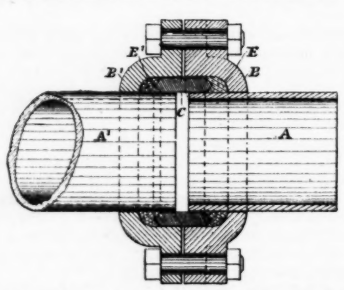
This "repair clamp ring" is shown in the engraving; and the following claims are made in respect to it: A repair device, comprising among its members a sectional clamp ring, having an annular recess adapted to receive a packing-ring, and provided with circular bolt-holes through both sections; the ring being also furnished with projections extending from one side. The projections are provided with polygonal recesses on their inner sides, with clamping bolts having round bodies and polygonal heads. The heads have projections to engage the exterior of the bell and adapted to engage the recesses of the projections, whereby the bolts are held in engagement with the bell, and prevented from turning.





Pipe Couplings.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 1997; Jan. 31, 1900.

The object of this invention is to provide a tight coupling for plain-end pipe, and to provide for expansion and contraction without using the force or pressure of the gas or liquid conveyed in the pipe. The main feature of difference in this invention from others in use, is said to be that, instead of using two loose rings, the patentee uses only one, dispenses with the rubber gasket, and omits utilizing the force or pressure of the material conveyed in pipes to assist in compressing the elastic packing, by using mechanical means only to compress it.



In joining pipes with this coupling, section B of the coupling is slipped over the pipe A; and the elastic packing E is then slipped on the pipe. The loose ring C is then slipped on the pipe so that the end of the pipe comes nearly to the centre of the loose ring. Then the other section of the pipe coupling B^1 is slipped on the end of the pipe A^1; and the elastic packing E^1 is slipped on the pipe. The end of the pipe is then put into the loose ring C, so that it will nearly (but not quite) abut the end of the pipe A, and in line with each other. Then the sections B and B^1 of the coupling are drawn together; the bolts are put in the holes in the outer rim of the coupling; and the nuts are put on the bolts and screwed up. This forces the loose ring C against the elastic packings E and E^1, fixing them tightly to the pipes and sections of coupling B and B^1; and at the same time the elastic packing-rings E and E^1 are packed tightly to the ends of the loose ring C—making "a perfectly tight packing at all exposed points of escape."

APPLICATIONS FOR LETTERS PATENT.

7057.—Brewer, G, "Conveyors for coal and other materials." A communication from The C. W. Hunt Company. April 17.
7080.—Boult, A. J., "Condensers." A communication from P. Audouin. April 17.
7185.—Fehse, O., "Support for incandescent mantles." April 18.
7201.—Thompson, W. P., "Bunsen burners, and means for igniting same." A communication from F. W. Braun. April 18.
7208.—Lindemann, O., "Internal combustion motors." A communication from E. Körting. April 18.
7209.—Lindemann, O., "Purifying gases." A communication from E. Körting. April 18.
7210.—Welsbach, C. Auer von, "Osmium illuminating filaments." April 18.
7211.—Welsbach, C. Auer von, "Osmium vacuum lamps." April 18.
7228.—White, J. W., and Forster, J. S., "Conveyors." April 19.
7233.—Hookham, G., "Water-meters." April 19.
7252.—Bleach, H., and d'Alquen, H., "Illumination lights." April 19.
7253.—Seraine, J., "Gas-motors." April 19.
7357.—Schattner, E., and Harmer, F. W., "Incandescence lamps or burners." A communication from M. Cohen. April 20.
7384.—Collis, A. B., "Gas and oil engines." April 21.
7423.—Pettibone, H, "Manufacture of gas." April 21.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Proposed New Technical Gas Institution.

Sir,—In perusing your article in this week's issue, I notice that it is proposed to exclude from membership persons who are managing-directors of joint-stock companies.

It appears to me that this wants qualifying, so as to render eligible managing-directors of non-statutory gas-works working under the Joint-Stock Companies' Acts, if such managing-directors are properly qualified gas engineers.

Birmingham, April 26, 1900. H. Ashton Hill.

Mr. E. H. Stevenson's Evidence on the Bradford Bill.

In reporting the evidence given by Mr. E. Herbert Stevenson on the Bradford Bill, in the "Journal" for the 17th ult., it was stated (p. 1011) that, in answer to a question by Mr. M'Kenna, he said "he knew of no instance since 1869 where the undertaking of a statutory gas company had been purchased compulsorily. There had been many water cases." Mr. Stevenson says this summary report does not represent correctly what he stated. The actual question and answer were as follows: "[Q.] Do you know any precedent later than 1869 for compulsory purchase against the will of a statutory company?—[A.] There is no case at all, Sir, in which it has been fought through both Houses. I think there is only one case of a water undertaking where it has been fought through both Houses; but there are several where it has been fought in one House, and then either an agreement come to or no opposition in the second House. You see, the company, having lost in one House, usually considers that it is not worth while spending a lot of money in the second House, and risking further loss." Mr. Stevenson points out that, while he stated that there had been no compulsory purchase fought through both Houses, his evidence showed that there had been several cases which he considered compulsory fought through the first House.

Water-Closets v. Earth-Closets at Hull.—At a meeting of the Water and Gas Committee of the Hull Corporation on Monday last week, a report was presented by the Engineer (Mr. F. J. Bancroft), with reference to the proposed substitution of water-closets throughout the city for the present system of earth-closets. If the recommendations of the Sanitary Committee with respect to the substitution of water-closets for 36,109 earth-closets is adopted, he estimated the additional quantity of water required per day for flushing purposes at a million gallons at least, on the low basis of ten flushes per day for each closet.

Issue of Further Capital by the South Staffordshire Water Company.—An extraordinary meeting of the South Staffordshire Water Company was held last Thursday, for the purpose of creating and authorizing the issue of new stock. The Chairman (Mr. Frank James) explained that their Act of 1893 empowered them to raise £150,000 of additional capital, and part of this amount had been issued. The meeting was to authorize the issue of the balance; and he accordingly moved that the remaining £50,000 of capital be now issued. In explanation of the necessity for the increase, he stated that they were spending money in order to make provision for the extraordinary demand for water in the district. The motion was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress was made with Private Bills last week:—

Bills read a second time and committed: Cleethorpes Gas Bill [Lords], Falkirk and District Water Bill [Lords], Great Berkhampstead Water Bill [Lords], Motherwell Water Bill [Lords], Portland Urban District Gas Bill.

Bills read the third time and passed: Glastonbury Corporation Gas Bill, Maidenhead Gas Bill.

Petitions were presented against the following Bills: Exmouth Urban District Water Bill, Falkirk and District Water Bill, Motherwell Water Bill.

On Thursday, the usual returns relating to gas undertakings—for the year ending Dec. 31, 1899, in the case of Companies, and for the year ending March 25, 1900, in that of Local Authorities—were presented, and ordered to be printed.

HOUSE OF LORDS COMMITTEE.

(*Before Lord* CLIFFORD OF CHUDLEIGH, *Chairman; the Earl of* PORTSMOUTH, *the Earl of* ROMNEY, *Lord* HATHERTON, *and Lord* SEATON.)

DORKING WATER BILL.

This Bill, which is to authorize the Dorking Water Company to raise further capital, acquire more land, and construct additional works, came recently before the above-named Committee.

Mr. PAGE, Q.C., and Mr. F. HAMILTON appeared for the Company; Mr. WEDDERBURN, Q.C., and Mr. WILLIAMS represented the Dorking Urban and the Dorking Rural District Councils, who presented a joint petition against the Bill.

Mr. PAGE said the Bill was promoted by the Dorking Water Company mainly to enable them to raise additional capital to the extent of £20,000. The Company was incorporated by Act of Parliament in 1869; and the capital raised up to the present time was £29,574. This was all expended by the year 1898. For improvements which had taken place since, it had been necessary to rely upon the income, out of which there had been expended for capital purposes as much as £2236. The result had been disastrous to the shareholders; for whereas, up to 1898, ordinary shareholders had been receiving dividends varying from 7 to 8½ per cent., since then, in consequence of the income being spent on capital, they had had only 5 per cent. One of the objects of the Bill was to enable the Company to raise a certain amount of capital for the purpose of paying back this £2236. The Company were authorized to supply water to what was known as the old parish of Dorking, which, since the passing of the Local Government Act, 1894, had been subdivided into the parishes of Dorking Urban and Dorking Rural—the latter comprising the two hamlets of Holmwood and Westcott. The population of Dorking Urban at the last census was 7132; and the rateable value was £43,000. Dorking Rural had a population of 3829, and a rateable value of £22,000. The population of Dorking Urban and Rural in 1881 was 9577, and in 1889 it had increased to 10,961. Since 1891, there had been a considerable augmentation of the number of houses, and also of the population in the urban district, and to a certain extent in the two hamlets; and Westcott was being somewhat largely extended. Under the powers of the Act of 1869, the Company had originally one source of supply, which was from what was known as the Tower Hill well and pumping-station, and was freehold. This was soon found to be insufficient; and other supplies had from time to time been obtained, particulars of which Counsel gave. One of the objects of the Bill was to secure parliamentary authority for holding these other sources of supply. It was also proposed that filter-beds should be constructed; and the total amount required was £20,000. Of this sum, £16,000 was to be raised by the issue of shares, and £4000 under borrowing powers. Counsel then referred to the statements made by a section of the Urban District Council with regard to the Company being unable to properly perform their duties, and to the negotiations set on foot for the Local Authority acquiring the undertaking. The Company agreed, subject to the approval of the Local Government Board, to sell their property to the Council. The latter, however, were met by the Local Government Board with the objection that the Company's area of supply extended beyond the urban limits; and, by virtue of a section of the Public Health Act, a District Council could not buy an undertaking which extended beyond the district of the proposed purchaser. In the spring of last year, the Council endeavoured to get rid of this difficulty by applying to the County Council to incorporate the parish of Dorking Rural in the urban district; but the County Council, after considering the matter, decided that they had heard of no adequate reason for extending the boundaries of the urban district. Therefore, it had been impossible for the Urban Council to buy the undertaking. It might be asked why, if the Company were willing to sell in 1898, they were not willing to sell now. There were various reasons. The Company had made themselves liable for between £2000 and £3000, which they had no authority from Parliament to expend on capital account. They had, moreover, considerably improved the sources of supply of late; and this being so, they thought their future must be better than their past state, and that they would not only be able to fully do their duty to the inhabitants of the district, but would be able to improve their financial position, and restore to the ordinary shareholders what had been spent out of the income on capital account. They had therefore declined to renew the negotiations for the sale of the undertaking, and came to Parliament and asked that they should not be compelled to sell their property either to the Urban District Council alone, or to the Urban and Rural District Councils combined. Lately a Joint Committee of the two Councils had been formed, and on the 19th of January a letter was written to the Company, upon the Committee's instructions, asking whether they would be prepared to insert a clause in their Bill to enable the Councils to acquire the undertaking on terms similar to those incorporated in the agreement entered into between the Company and the Urban Council in 1898. The reply was to the effect that the Directors were not prepared to insert such a clause. The Committee reported to their respective Councils; and it was unanimously resolved by the Urban Council to present a petition against the Bill. The Rural Council, which consisted of 14 members, also resolved to petition against the Bill; but only five members voted—three in favour of the petition, and two against it. It was remarkable that of the four representatives of Holmwood and Westcott on the Council, only one voted in favour of the petition and two against it; while the fourth did not vote. At the annual parish meeting of the Rural District Council, a resolution was carried that the petition ought not to be proceeded with, and that the parishioners were quite satisfied with the way in which the Company were performing their duties. With regard to the Urban District Council, he was informed that no ratepayers' meeting had been held, and that there was no desire on the part of the public for the change suggested to be made.

The following evidence was then given:—

Mr. *G. R. Strachan* stated that he and his partner had advised the Company for fifteen or twenty years. In the summer of 1898, the effect of the continual drought was very great. Last year, which was extremely dry, there was no curtailment. The capital the Company were applying for was necessary; and he did not think it would last more than ten years, as they supplied a large and scattered area. No serious complaints had ever been made against the Company.

In cross-examination by Mr. WEDDERBURN, witness said he was in favour of water undertakings being owned by local authorities. He did not, however, think that one should be given power to purchase within an indefinite time, but that they should make up their minds if they were going to purchase within three or six months. In another ten years the Company would have to apply to Parliament again for money, but not for quite fresh works.

Mr. *R. Barclay*, the Chairman of the Company, gave evidence in support of Counsel's opening statement as to all the capital of the Company having been spent, and a portion of the income used for capital purposes. He also said that recently the Directors had carefully considered whether or not they ought to sell, and they had come to a negative decision. The present circumstances were wholly different from those of 1898. Since that time they had obtained substantial supplies of water from their new works, upon which they had spent a considerable sum of money. The deputations from the Urban and Rural Councils suggested that the Company should consent to a clause being inserted in the Bill enabling them to purchase the undertaking at any time within ten years; and this they objected to—being of opinion that it would put the shareholders in an unfair position.

Mr. WILLIAMS (in cross-examination): Do I understand that the Company are willing to sell when it suits their convenience?

Witness: Yes.

If the Committee insert a clause authorizing us to promote a Bill in Parliament next session, will the Company then agree to such an arrangement?—As Chairman, I cannot give a direct answer to that without consulting my fellow-Directors.

Mr. *J. Daws*, Manager to the Company, said that at present they had 9000 consumers, and were giving a continuous supply of water. In 1898, owing to the non-completion of the Deepdene works, the service was not a continuous one all through the summer. Since the completion of those works, however, with two exceptions, they had been enabled to furnish a constant service, notwithstanding a repetition of the drought last summer, and the town being one of the hardest places in the country to supply constantly.

Mr. *A. J. Canter*, representing the Westcott Ward on the Rural District Council, said his constituents were against the undertaking being purchased by the Local Authority.

Evidence was then called for the petitioners.

Mr. *G. Scales*, Clerk to the two District Councils, spoke as to the number of complaints received by the Urban Council in 1898, in regard to the insufficiency of the supply of water by the Company during June, July, and August. He said a Joint Committee of the Urban and Rural District Councils formulated a scheme for the purchase of the undertaking, and a definite agreement was arrived at between the Councils and the Company in September, 1898, subject to the approval of the Local Government Board. The agreement, however, fell through, owing to circumstances which had been explained. As far as the Urban Council were concerned, there had been no change of opinion as to the undertaking being purchased; and the Council were willing to pay a reasonable price for it. He understood that the Company objected to a clause being inserted to allow the Council to purchase at any time within ten years. To meet this objection, however, if a clause were inserted giving the Council power to purchase, they would immediately take steps to bring in a Bill next session to carry out the project.

In cross-examination, witness said he did not know that, before presenting a petition against the Bill, they ought to have taken a resolution of an advertised meeting of ratepayers. As this had not been done, he supposed he would be personally liable for the costs incurred.

Mr. *G. S. Mathews*, Surveyor to the Urban District Council, Dr. *S. Rideal*, the Water Examiner at Dorking, and Mr. *H. E. Ponting*, a member of the Rural District Council, supported the petition.

Mr. WEDDERBURN said that for many years it had been an admitted principle in Parliament that water supplies should be in the hands of local authorities, if they so desired. It had been enough, in many cases, for the local authority to say: "Do not give the company additional capital, because we will undertake to apply for powers to purchase next year." It was difficult for the Dorking Company to say that the Local Authority should not have a clause to purchase, because in 1898 they agreed to sell, and, but for the technical view taken by the Local Government Board, the undertaking would have passed into the hands of the Council. The water supply had not been satisfactory to the inhabitants of Dorking; and the view of Dr. Rideal was that it would have to be entirely revised in the course of a few years. For two reasons, therefore, the present was the time for the Local Authorities to come to Parliament. The Company were applying for additional capital; and this was the moment to ask the Committee to give them the purchase clause. Also, the people of Dorking saw that whoever supplied water would have to begin all over again; and if there was to be a new supply, and a great alteration, they wished it to be done by the Local Authority, and not by the Company The only suggestion against it that had been made in that case was that a section of the Borough Funds Act had not been complied with; but this applied solely to the costs of the petition. He asked the Committee

to insert the following clause in the Bill; and if they would not do so, not to pass the measure. Counsel then read the clause, as follows:—

If the Dorking Urban District Council and the Dorking Rural District Council or either of them shall introduce a Bill into Parliament, which they or either of them are hereby empowered to do, and shall *bonâ fide* promote the same in the next available session of Parliament, to empower them or either of them to purchase the undertaking of the Company, or to provide for the constitution of a Water Trust, and to empower the Trustees so to be constituted to purchase the undertaking of the Company, the Company shall not oppose such Bill, except in so far as may be necessary in order to secure the insertion therein of clauses to protect their interests with respect to such purchase; and for that purpose the Company shall be at liberty to petition either or both Houses of Parliament, and to appear on such petition by Counsel, Agents, and witnesses, if they think fit. And if the said District Councils or either of them obtain an Act authorizing such purchase, and if they or either of them or the said Trustees so authorized (hereinafter called "the purchasers") shall give a written notice of their intention to purchase within six months of the passing of such Act, the Company shall, at the expiration of such six months, sell and transfer, and the purchasers may purchase and acquire, the undertaking, property, rights, powers, and privileges of the Company, subject to all the existing mortgages, obligations, and liabilities of the undertaking. Any such sale and purchase shall be on such terms and conditions as may be agreed upon between the Company and the purchasers, or, failing agreement, shall be determined by arbitration in accordance with the provisions of the Lands Clauses Act with reference to the purchase and taking of lands otherwise than by agreement. And in the construction of the said provisions, the expression "the promoters of the undertaking" shall mean the purchasers, and the expression "lands" shall mean the undertaking of the Company: Provided that, in addition to the sum to be paid by the purchasers to the Company under the foregoing provisions of this section, the purchasers shall pay to the Company—(*a*) the reasonable costs of obtaining this Act, and (*b*) the reasonable costs of winding up the Company. And the purchasers shall also pay to any officer (other than a director) and servant (other than a weekly servant) in the regular employment of the Company, who has been in such employment for a period of ten years or upwards, and who shall not be willing to continue or who shall not be continued in the service of the purchasers, an amount equal to two years' salary.

Counsel added that the effect of that clause would be that if next session the two Councils, or either of them, obtained an Act authorizing them to purchase, they would have to give the Company written notice of their intention to do so within six months of the passing of the Act.

Mr. PAGE, in reply, said he should have asked the Committee not to insert the clause in the Bill, even were it the joint offspring of the two Local Authorities, which it was not, but only of the Urban District Council. There was no reason for the Committee to insert the clause, for it would be open to the Councils to come next year to get leave to buy out the Company. He asked the Committee to compel them to wait until they had put themselves in the right position to come—until they were satisfied that they were voicing the desires of their constituent ratepayers in presenting the Bill to Parliament, and not when there was a doubt in regard to the wishes of one district.

The room was then cleared. On the re-admission of the parties,

The CHAIRMAN announced that the Committee had decided to pass the preamble of the Bill.

On the consideration of clauses, the promoters and opponents of the Bill agreed to the insertion of a clause to the effect that the District Councils shall, within twelve months after obtaining the Act of Parliament, which is to be unopposed, give notice of their intention to purchase, and that the vendors shall sell. If the parties cannot mutually agree to terms, they are to be settled by arbitration under the provisions of the Lands Clauses Act. In addition to the sum to be paid by the purchasers, they are to pay the Company their reasonable costs of winding up, and compensation to officers; and the Company are not, before obtaining the consent of the Councils, to expend before Dec. 30, 1901, more than £5000. The Company are also to pay half the cost of the joint Councils' petition against the Bill.

HOUSE OF COMMONS COMMITTEE.

(*Before Sir* T. GIBSON CARMICHAEL, *Chairman*, *Sir* CAMERON GULL, *Mr.* CARLILE, *and Mr.* HORNIMAN.)

AIRDRIE, COATBRIDGE, AND DISTRICT WATER TRUST BILL.

This Bill, which is to constitute a Water Trust for the burghs of Coatbridge and Airdrie and the adjacent district, and to vest in it the undertaking of the Airdrie and Coatbridge Water Company, recently came before the above-named Committee.

Mr. J. D. FITZGERALD, Q.C., Mr. GULLY, and Mr. W. RUSSELL appeared for the promoters; Mr. BALFOUR BROWNE, Q.C., Mr. WORSLEY TAYLOR, Q.C., and Mr. ERSKINE POLLOCK, Q.C., for the Airdrie and Coatbridge Water Company; Mr. LITTLER, Q.C., Mr. PEMBER, Q.C., Mr. WORSLEY TAYLOR, Q.C., Mr. CLAUDE BAGGALLAY, Q.C., and Mr. W. NEILSON, for the Caledonian Railway Company; and Mr. POPE, Q.C., Mr. BALFOUR BROWNE, Q.C., and Mr. FORBES LANKESTER, for the North British Railway Company.

Mr. FITZGERALD, in opening the case, said the Bill was promoted by the two Corporations of Airdrie and Coatbridge and the County Council of Lanarkshire for the purpose of constituting and incorporating a Water Trust, and transferring to it the undertaking of the Airdrie and Coatbridge Water Company. This action of the promoters was the outcome of a decision given last year by a Committee of the House of Commons on a Bill which was then promoted by the Company, which was that the Bill should only proceed on condition that if a Trust was formed to acquire the undertaking of the Company, it should be transferred. Within the limits of supply in the burghs and the county, there was a population of between 70,000 and 80,000. The Company was incorporated as long ago as 1846; and for 30 years the shareholders had always been paid their maximum dividends. When these had been received by a company, any income more than sufficient to pay them should be applied in reducing the price of water. What happened with the Airdrie and Coatbridge Company was what often occurred with companies similarly situated. As the shareholders had been receiving for years their maximum dividends, and having, owing to the provisions of their Act of 1846, very extensive powers of charging for water, which they were not obliged to exercise to the full extent to earn their maximum dividends, they ceased to have any substantial interest in the economical or efficient carrying on of the water undertaking. If any money was spent wastefully or extravagantly, they could always meet it out of the surplus revenue. He did not wish to go in detail into the matters discussed last year. It was sufficient to say that the Company had been unfortunate. They had applied on several occasions to Parliament, and their Bills had been rejected; and, of course, considerable expense had been incurred, which fell entirely upon the consumers. In 1892, owing to the increase of population in the area of supply, they obtained an Act for the construction of new works; and in carrying these out they became involved in very serious litigation and heavy costs. They appear to have had every misfortune that it was possible for a Company to have in carrying out the works. When they came to construct one reservoir, they found they could not get a good holding-place for their embankment; and the site of another reservoir had to be changed. The position they got themselves into was that their estimates were exceeded by as much as 50 per cent., their capital was overspent, and they were obliged to apply to Parliament for further powers and more capital. It was not unnatural that this state of things should have created very great discontent in Airdrie and Coatbridge, as well as in the county surrounding; and what increased the discontent was that the result of all this miscalculation, mismanagement, or misfortune—whatever name they chose to give it—was that the shareholders met the difficulty by raising the water-rate from 1s. to 1s. 4d. in the pound, taking for themselves their maximum dividends as before. Another source of dissatisfaction was that in the Acts of the Company no rates were fixed for the supply of water for manufacturing operations. A great many people required water for such purposes, and the terms on which they were to receive it were left by the Acts to be settled by agreement. All the petitioners against the Bill offered opposition confined practically to clauses. They objected to the terms for carrying out the proposed transfer; and it would be the business of the promoters to show that they were just and fair, and honourably carried out the decision of the Committee of last year. He gave the assurance that the promoters would take over and assume the liability for the uncompleted works of the Company; but while he did this, he could not help saying that the Company had increased the difficulty of the proposed transference by entering upon arrangements for the erection of offices, and letting the contract for the new reservoir.

Evidence was then given in support of the promoters' case.

Mr. *J. M'Murdo*, Joint Town Clerk of the burgh of Airdrie, examined by Mr. FITZGERALD, gave the Committee some particulars as to the water requirements of the district, and the manner in which the Water Company had catered for them, and expressed the opinion that the time had come when the undertaking should be in the hands of a Trust. He laid special emphasis upon the requirements of manufacturers.

In cross-examination by Mr. WORSLEY TAYLOR, witness said the whole desire of the promoters was to be just and fair to the Company, and to carry out honourably the decision of the Committee of last year. He made no charge against the Company of wasteful expenditure; and as to the letting of the contract for the reservoir, all he said was that the Company were wrong in taking action at the time they did, with this transference in view. He should have no objection to inserting in the Bill a provision to the effect that the purchase of the undertaking should be completed within six months of the publication of the award of the arbitrators.

The CHAIRMAN (interposing) said the Committee were of opinion that there was little difference between the parties, and that an arrangement could easily be arrived at.

Mr. FITZGERALD said the promoters were prepared to undertake to pay all debts, sums of money, and claims on capital account, provided a statement of them was submitted by the Company within one month before the commencement of the arbitration, and that the liability was limited to the amounts down in the statement.

Mr. WORSLEY TAYLOR pointed out that subsequent to the presentation of such a statement the Company might incur a liability which the Trustees ought to discharge—a liability, for instance, connected with the maintenance of the undertaking.

An intimation was here given by the Committee that this should be provided for in the Bill.

Mr. WORSLEY TAYLOR said, after this expression of opinion, there would be no difficulty in arranging a suitable clause.

After some discussion between Counsel, it was arranged that the final adjustment of the matter should be postponed.

Mr. FITZGERALD then dealt with the opposition of the two Railway Companies. He explained that at present the rate of charge for water for manufacturing purposes was fixed by agreement, and that last year the Corporations undertook that, if they acquired the water supply, they would fix the rate in the statute. Therefore, in this Bill the promoters set out a sliding-scale which moved in sympathy with the charge for domestic purposes. The Railway Companies alone objected to the scale, and wished the fixing of the rate to be left in the first instance to agreement, and failing this, to the decision of the Sheriff.

Mr. *M'Murdo* was recalled, and gave evidence in support of the arrangement in the Bill. He pointed out that the rate proposed was less than that now paid by the railways to the Water Company, and that it was one which the whole trading community, with the exception of the Companies, approved of and accepted. Last year the promoters satisfied Parliament that the transference of the undertaking to a Trust would be in the interest of the community. Now it was suggested that this transference would increase the water-rates, and thus inflict hardship upon the Railway Companies. On this point, he might say that last year a statement was put before the Committee showing that in ten cases in Scotland where there had been a transfer from a Company to a Trust there had been no increase in the rates in any of them, and in eight there had been a decrease.

Mr. *George H. Hill*, M.Inst.C.E., was examined with reference to the clause in the Bill fixing the maximum rates. It set forth that the Water Trustees should furnish water for other than domestic purposes at rates not exceeding the following: 7d. per 1000 gallons up to 100,000 gallons per half year; 6d per 1000 gallons of excess beyond 100,000 gallons up to 200,000 gallons per half year; and 5d. per 1000 gallons of excess beyond 200,000 gallons per half year. The clause further provided that

whenever the domestic water-rate was reduced below, or increased above, 1s. 2d., a proportionate reduction or increase, as the case might be, should be made in the rates for other than domestic supply; so that the rate per 1000 gallons up to 100,000 gallons should be as nearly as possible 7-14ths of the domestic rate, the rate per 1000 gallons of the excess beyond 100,000 gallons up to 200,000 gallons as nearly as possible 6-14ths, and the rate per 1000 gallons of the excess beyond 200,000 gallons as nearly as possible 5-14ths. Witness said he considered this clause fair and reasonable and extremely convenient, because it provided a sliding-scale the action of which would soon become familiar. People would know exactly what they had to pay. He was not surprised to learn that all the traders of the district had accepted the arrangement. He had seen the clause proposed by the Railway Companies, but he preferred the one in the Bill, because it had the great merit of being calculated to avoid litigation.

In cross-examination, witness said he preferred that the Water Trust should determine the price, rather than that it should be left to the decision of the Sheriff. The North British Railway Company used about 80 million gallons of water per annum, for which they now paid the Water Company at the rate of 6d. per 1000 gallons, whereas under the Bill they would pay 5d.

The Chairman intimated that the Committee did not think the clause had been justified by evidence.

Mr. Fitzgerald said there was the evidence that all the traders in the district accepted the clause.

The Chairman: If you cannot produce any further evidence, the clause must go.

Mr. Littler then asked the Committee to insert a clause, the draft of which he submitted.

Mr. Fitzgerald said the promoters could not accept it; but if the case were adjourned, he would present a clause of his own, and the Committee would be able to judge between the two clauses.

This course was adopted.

At the meeting of the Committee on a subsequent day,

Mr. Fitzgerald said he was able to inform the Committee that the adjournment had borne fruit, and that, after going through the amendments proposed by the Water Company, the promoters were in a position to present to the Committee agreed amendments so far as the Company were concerned. He thought he might say that they ensured that the Company would get full and fair value for their undertaking. The only other matter left was the new clause providing a maximum scale of charges for the supply of water for trade purposes. The Railway Companies, who used a large amount of water, objected to the original clause, and in their petitions suggested that the provisions of the Burgh Police (Scotland) Act of 1892 should be substituted. The promoters had now adopted the suggestion, and they put before the Committee a new clause in the following terms:—

No person shall be entitled, without special agreement with the Trustees, to use the water supplied through the pipes of the Trustees, except for domestic and ordinary purposes; but when there is a supply of water more than is required for such domestic and ordinary purposes within the limits of supply, the Trustees shall, if so required, contract with any person or persons within such limits to supply any public baths and washhouses, works, manufactories, or other premises within the limits of supply, with water at such rate and upon such terms and conditions as may be agreed on; and in the event of disagreement, either as to the ability of the Trustees to give the supply or as to the rate, terms, or conditions on or in respect of which the supply is to be given, the same shall be fixed by the Sheriff of the county of Lanark (excluding Sheriffs-Substitute), upon summary application by either of the parties; and the decision of the Sheriff shall be final: Provided that when water is thus supplied from such surplus it shall not be lawful for the Trustees to charge the parties obtaining the same both with the domestic water-rate in respect of the premises for which such supply is given, and also for the supply of water obtained by them; but the Trustees may either charge the domestic water-rate chargeable in respect of such premises, or charge for the supply of water furnished to the same, as they shall think fit, and any rate or payment for water supplied under this section may be recovered by the Trustees in the same manner as the domestic water-rate.

Mr. Pope objected to the exclusion of Sheriffs-Substitute, on the ground that as, according to the law of Scotland, the term "Sheriff" included Sheriffs-Substitute, the promoters were seeking to alter the general law by a Private Act without sufficient reason.

After some argument, the words within parentheses in the clause were struck out.

Mr. Pope invited the Committee to insert in the next clause (43) words to secure that the Trust should not be allowed to supply water outside the limits, unless the requirements both for domestic and trade purposes had been met within them.

Mr. Fitzgerald submitted that the proposed words were quite unnecessary, and contrary to practice.

Mr. Pope said that similar words had recently been inserted in the East Stirlingshire Water Bill. The reason why the Railway Companies pressed the matter was that if they were to make an application to the Trust for more water, the latter might reply that they could not furnish it because they had certain outside areas to supply.

The Chairman said the Committee decided to accept the words.

The other clauses having been adjusted, the Bill was ordered to be reported.

SUBWAYS UNDER LONDON STREETS.

A Select Committee of the House of Commons, presided over by Sir William Houldsworth, had under consideration, just before the adjournment for Easter, the Bill promoted by the Corporation of London to obtain, among other things, certain powers with respect to "making further and better accommodation for the laying of pipes, wires, and other apparatus in, over, or under streets, and as to the control of streets and structures across them, and the fixing of apparatus for public lighting in streets." The provisions relating to these matters are contained in Parts VI. and VII. of the Bill; and when they were reached, Mr. Littler, Q.C., who appeared for the promoters, stated that there were a large number of opponents to this part of the Bill, but it was one of considerable interest. It embodied to a great extent a new departure; but the City was in this as in so many other respects absolutely unique. It was no exaggeration to say that in no important thoroughfare was there a single square yard or foot of ground which did not enclose some sort of appliance for the public service—gas-mains, water-mains, pneumatic tubes, wires for electric lighting, electric energy, &c. In addition to all this, the Postmaster-General had served the Corporation with notices for the opening up of an enormous number of streets for the purpose of laying telephone wires. The Corporation were constantly having complaints of the delays which took place in City traffic, in consequence of the perpetual interference with the ground; and the power asked for in the Bill, to construct subways for the reception of pipes and wires, would, it was hoped, prevent the breaking up of the thoroughfares. The Corporation would not act in an arbitrary manner, and the Board of Trade would control their decisions.

Evidence was then given in support of these portions of the Bill by Mr. W. Bicknell, a Clerk in the service of the Corporation, Mr. D. J. Ross, M.Inst.C.E., their Engineer, and Sir J. Wolfe Barry, their Consulting Engineer. The last named witness explained that the desire of the Corporation was to take general powers for dealing with cases as they arose, instead of having in each instance to go to Parliament for special powers. The gas, water, and other companies could only be asked to put their mains into the subways or service works when the latter were fit and proper for the reception of pipes and wires. The construction of these works would be a gradual process, and it was designed to meet an evil of crying public importance. In cross-examination by Mr. Pope, Q.C., on behalf of the New River Company, Sir John admitted that the Bill would oust the jurisdiction of Parliament in regard to the subways, and substitute that of a Government Department. Sir Benjamin Baker also gave evidence. He stated that when the Metropolitan Railway was made (some 40 years ago) the gas and water pipes were diverted, although plans were not deposited to show how the work was to be done. This was bad enough then; but in carrying out the Central London Railway works opposite the Royal Exchange, he found the difficulty had increased tenfold. In making the District Railway from Blackfriars to the Mansion House, they took the opportunity of constructing a subway on each side for gas and water pipes—the Metropolitan Board of Works paying for it. The object now was to take opportunities, as they arose, of similarly collecting other pipes and wires elsewhere in the City.

Mr. Shiress Will, Q.C., for the Charing Cross and Strand Electric Lighting Company, called (in evidence against the Bill) Mr. Wilmot Seale, Secretary of the Company, who stated that they feared the powers which the Bill would confer on the Corporation, because it would enable the officers to dictate and control the system of supply, and the working of the undertaking; indeed, the powers were such as no public authority hitherto had been allowed to exercise in connection with electric lighting undertakings.

The Committee were then addressed by Mr. Shiress Will, who dwelt on the importance of insisting on the subways which the Corporation sought power to construct being of such dimensions as would afford room for men to get at electrical wires for purposes of repair. His objection to the Bill, however, would not be so great if his learned friends would undertake that any subways which the Corporation might make should be of the same character as those constructed under the London County Council Subways Act, 1893. At the same time, he contended that the Committee were now being urged to create a precedent of a very dangerous character, as they were asked to sanction a general power to construct subways under another name, subject only to the approval of the Board of Trade. Mr. Pope said the Bill seemed to him to be capable of doing a great deal of mischief. The Corporation, however, had done their best to meet him; and he was not disposed to resist it except on the ground of principle. It was manifest that anything which avoided the constant breaking up of the streets would be a great advantage; but if the Bill were passed, it would oust the jurisdiction of Parliament, and substitute for it that of a Government Department. This was a new principle in legislation. No doubt the Board of Trade had at present *quasi*-legislative powers; but they could only be exercised subject to an appeal to Parliament. Under this Bill there would be no such appeal to Parliament. Mr. Pember, Q.C., for the East London Water Company, made the same point, and objected to the vagueness of the definition clause, which, he said, invented a new term—"public service works." Mr. Balfour Browne, Q.C., for the City of London Electric Lighting Company, said his clients had spent £490,000 in the City, had laid 500 miles of conduits (mostly under the pavements), and supplied 436,000 lamps of 8-candle power each, and 548 arc lamps for street-lighting purposes. They complained seriously of the Bill, which would render them liable to remove all their wires from the streets, and place them in a conduit after they had been laid under the sanction of an Act of Parliament. The Corporation treated the Electric Lighting Companies worse than they treated the Gas and Water Companies. In the case of the latter, they intended to provide for a continuance of their supply during alterations; but they would be able to cut off the supply of his Company, and absolutely ruin them, because they were under a statutory obligation to keep up their supply. Mr. Littler remarked that if any amendments of the kind suggested were considered necessary by the Committee, the Corporation would be very glad to make them on the clauses. Mr. Balfour Browne said he was dealing with the preamble. He wished the Bill to be rejected as being most unfair throughout.

Mr. Littler then replied. He said that the two Electric Lighting Companies were the only serious opponents of the Bill. The Gaslight and Coke Company had withdrawn all opposition, and his friend Mr. Pope only took exception to the proposals of the Corporation on the ground that they were contrary to parliamentary precedent. He (Mr. Littler) contended that this was really not the case; and he quoted several Acts of Parliament in which clauses had been inserted giving equally wide powers to different public bodies. He declared that the Bill was a fair and honest attempt to put an end to a state of things which caused much inconvenience in the City. He added, in answer to the Chairman, that he saw no reason why the Electric Lighting Companies should not be put on the same footing as the Gas and Water Companies with regard to continuous supply.

After deliberating in private, the Chairman announced that the Committee had decided that the preamble was proved; but at the same time they thought the Bill was one which would have to be very carefully dealt with on the clauses. The Committee were of opinion that provision

should be made for the continuance of the supply of electricity during alterations. This point ought to be conceded to the Electric Lighting Companies as well as to the Gas and Water Companies.

LONDON WATER COMPANIES AND THE RIVER LEA.

As already mentioned in the "JOURNAL," the consideration of the four Bills dealing with the Metropolitan Gas Supply, which had been referred to a Select Committee of the House of Commons presided over by Mr. Oldroyd, was delayed in consequence of the long inquiry necessitated by the importance of the measure for the reconstitution of the Lea Conservancy Board, which preceded them on the list. As far as our readers are concerned, the Bill is only of interest from the fact that the Lea is drawn upon by the New River and East London Water Companies, who make an annual payment to the Conservators for the privilege.

Owing to the number of parties affected by the Bill, there was a strong array of Counsel present when Mr. Worsley Taylor, Q.C., opened the case for the promoters. He explained at the outset that the Bill was introduced by the Lea Conservancy Board in fulfilment of a pledge given to Parliament last session. He gave a sketch of the history of the river from the time of King Alfred, and went on to say that the present Conservators had jurisdiction over 27¾ miles of navigation. The reason why they were now proposing to reform themselves was that since 1890 one person and another had from time to time introduced Bills into Parliament, not so much for the purpose of altering the constitution of the Board, and not quarrelling with the way in which the Board had done their duty with the limited means at their disposal, but rather with the object of getting some representation where it did not at present exist for themselves, or some more representation in cases where they had it already. The points for the Committee to consider were these: What should be the number of representatives on the Board in future, what interests should be represented, and in what proportion should those interests be represented? He should propose that the number should be kept at thirteen, or thereabouts. The London County Council had proposed fourteen, though, modestly enough, they had contemplated monopolizing seven of the number. He should suggest, in the terms of the Bill, that the seats on the Board should be allocated as follows: Appointed Members.—One to the Herts County Council, one to the Essex County Council, one to the Middlesex County Council, two to the London County Council, one to the Corporation of London, one to the Corporation of West Ham, one to the New River Company, and one to the East London Company. Elected Members.—One to be elected by the Local Authorities and riparian owners in the upper district, one by those in the middle district, one by those in the lower district, and one by the bargeowners. The Bill would give enlarged conservancy powers, mostly dealing with pollution. It was proposed to increase the aggregate yearly sum payable to the Board by the New River and the East London Water Companies to £8000, of which £3750 would be paid by the former and £4250 by the latter. The New River Company drew 22 million gallons, and the East London Company 36 million gallons daily out of the Lea; and it was necessary that a higher price should be charged the Companies for this water than they were now paying, in order to enable the Board to deal properly with the purity of the river.

The first witness called was Mr. George Corble, the Clerk to the Board. He said he considered it important, whatever the constitution of the Board might be in the future, that the trading interests should be adequately represented. He described the composition of the Board, which included some of the largest toll-payers on the river. The Conservators did not pay their way every year, and they were not able in an ordinary year to put £1500 to the sinking fund, for which the Act of 1874 provided. Last year the total income was £23,283, and the expenditure £23,717; showing a deficit of £434, or, with the sinking fund, £2000. There had been a deficit on twenty years' working. He thought it was fair to charge the Water Companies an increased rent. It was only right that the Board should reap some of the benefit of the enhanced value of the water, in order to enable them to keep up and improve the navigation, and benefit the districts through which the river passed.

In the course of his cross-examination by Mr. Pember, Q.C., for the East London Water Company (who queried what the Company would get for the £4500 which they were asked to pay), witness said they would have the benefit of the improved navigation and of the extra supervision over the river. In answer to Mr. Pope, Q.C., who represented the New River Company, witness said the Conservancy had undertaken new duties for the purification of the river, and this was the reason why Parliament had provided that the New River Company should contribute to the cost—that they should contribute in regard to these particular works, which would be of benefit to them. Mr. Pope said this was contrary to the present proposition. The witness replied that the question now was a new one. One point the Committee would have to consider was whether it was right that the contribution of the New River Company should be increased without additional benefit to the Company by the works to be carried out by the Board. Asked what was the object of the proposed change in the constitution of the Board, witness replied that the matter had been pressed upon them by the London County Council and the other Local Authorities. Moreover, the Board had large works to carry out, and they expected to get more money for their water. They wished to have an increased staff of sanitary inspectors. If the Board had not brought in the Bill, the County Council and the other Local Authorities would have done so.

Major Lamorock Flower, the Sanitary Engineer to the Board, whose duty was to prevent the pollution of the river, declared that the sum allowed for the purpose of the protection of the water by the Lea Conservancy Act of 1868 was totally inadequate. He did not consider prosecutions for river pollution advisable unless in special circumstances. In the thirty years which had passed since the establishment of the Board, they had proceeded only eight times, and the prosecutions had not been in all cases attended with success. The amount of pollution had been considerably abated. Analyses of the river water should be provided for, and tanks and apparatus obtained for testing divers modes of sewage treatment. To limit unduly the amount of money to be expended in protecting an area from which a water supply was drawn, was false economy in its worst sense. It was most important that the whole watershed of a river should be under the control of one conservancy board, for the tributaries frequently showed most dangerous pollutions, and required to be constantly looked after. The Middlesex County Council could assist, and so could the other County Councils comprised in the basin of the Lea; but the Conservancy Board should be the chief authority for the protection of the water. The New River Company should contribute in the same proportion as Hertford to the improvement of the river.

Mr. C. Nelson Tween, the Engineer to the Board, was the next witness. He stated that the navigation of the river had been much improved under powers conferred by the Act of 1850. After the passing of that Act, new works of considerable magnitude had been carried out till about 1870, since which date no new locks had been constructed. The works were in need of considerable repair. He thought the expenditure required to place the navigation in a proper condition was £99,500, which should be spread over ten years.

The Chairman of the Board (Mr. R. Benyon Croft) followed. He said he had specially considered the question of its constitution, owing to the repeated attempts of the London County Council and the West Ham Corporation to get increased representation on it. Last year, in view of the Bill then being promoted by the London County Council, by which they sought to have seven representatives on the Conservancy, a compromise was come to; the Board pledging themselves to introduce a Bill this year. In fulfilment of the pledge, they had sketched out the present scheme, which would fairly represent all the interests concerned. He considered it would not be advisable to give the Local Authorities a preponderating influence. The Board as at present constituted had worked well, and no change was required; but if any were made, it should be in the direction sketched out in the Bill.

Mr. H. L. Cripps, Parliamentary Agent to the London County Council, then gave evidence on their behalf. He contended that the Lea Conservancy Board was completely under the control of the Water Companies, and declared that they would not be able to meet the interest on their debenture stock if it were not for the payments received from the Companies. He considered that the Board should depend on statutory contributions rather than on voluntary payments; and if this were arranged, he should think there would be no one more likely to assist than the ratepayers of London. Mr. G. L. Gomme, the Statistical Officer to the Council, stated that the present Conservancy Board had not, in their opinion, met the requirements imposed by the Legislature. In dealing with this question, they had to consider the duties of the Board as to pollution, navigation, water supply, the maintenance of bridges, and so forth; and the proposals of the Bill would reduce the representation of the Local Authorities to a sham. So far as the Thames Conservancy was concerned, the Act of 1894 had done away with the representation of the riparian owners. Mr. Erskine Pollock, Q.C., addressed the Committee; contending mainly that the representation on the next Board should be arranged on the basis of population, and that, therefore, the London County Council should have a dominant voice.

Mr. Pember protested against the proposal to raise the East London Water Company's payment to the Conservators to £4500 a year—an increase of 130 per cent.—and to reduce their representation on the Board by 50 per cent. While the Board were making this claim on the Company, they did not, he said, ask the Local Authorities for anything, nor did they increase the rates of the toll-payers. Any new works undertaken by the Board would not benefit the Water Companies.

Mr. W. B. Bryan, M.Inst.C.E., the Engineer to the East London Company, said that, in order to take water from the Lea in summer, storage was absolutely necessary, and this had to be provided by the Company; whereas water could be taken at all times from the Thames without storage. This fact, he considered, had a bearing on the amount which ought to be paid to the Lea Conservancy Board for the water taken by his Company. He did not consider that the two Water Companies ought to be called upon to pay the large sum asked for in respect of the water drawn from the Lea.

The Committee were next addressed by Mr. Pope, who said the claim of the New River Company to representation on the Board was based on the rights of ownership. It would be unjust to call upon the Company, who would receive no benefit from the works under the Bill, to pay a large contribution towards the extra revenue for the Conservancy. The Company claimed an absolute right to the waters of the Lea over and above the quantity necessary for navigation. This right was acquired under Act of Parliament, subject to an annual payment of £3500 by the two Water Companies, and £42,000 as a capital sum by the New River Company.

The Committee having consulted, the Chairman announced that they had decided to approve of the preamble of the Bill generally, subject to any slight modification that might arise on the consideration of clauses. With regard to the provisions of the Bill, the Committee had determined that the constitution of the Board should be as follows: Bedford, Hertfordshire, Essex, Middlesex, and West Ham, one representative each; London County Council, two representatives; the Corporation of London and local interests, including Local Authorities within the watershed of the Lea, and situated in Hertfordshire, one representative each; the Local Authorities of Essex and Middlesex, Hackney, Poplar, and Limehouse, one each; the New River and East London Water Companies, one each; and, finally, the bargeowners, one representative. The Committee had further decided that the amount of the annual payments which the promoters asked for should be conceded—viz., £8000 for the general purposes of the Conservancy and £2000 for sanitation purposes, or £10,000 in all.

The clauses of the Bill were subsequently adjusted; and the Bill was reported.

New Joint-Stock Companies.—The Birmingham Incandescent Lighting Company, Limited, has been formed with a capital of £1000, in £1 shares, to manufacture, work, sell, let on hire, and deal in burners, meters, wires, and other gas and electrical accessories and appliances. The Barbados Manjak Mines, Limited, has been registered with a capital of £10,000, in £1 shares, to adopt an agreement with the Merivale Manjak Mines, Limited, H. J. Wenham, and Henchell du Boisson, and to carry on, in Barbados, or elsewhere, the business of miners and merchants of ores, metals, oils, tarry earth, &c.

LEGAL INTELLIGENCE.

ELECTRIC LIGHT COMPANIES SUED FOR PENALTIES FOR DEFICIENT SUPPLY.

At the Greenwich Police Court, last Tuesday, before Mr. Kennedy, the London Electric Supply Corporation, Limited, appeared in answer to seven adjourned summonses taken out at the instance of Mr. Thomas Allen Shoddick, the occupier of the Dover Castle public-house, Broadway, Deptford, for making default in their supply of electrical energy.

Mr. LAWLESS appeared for the prosecution; Mr. C. M. BAILHACHE represented the Company.

Mr. LAWLESS, in opening the case, remarked that it was an important one, and one of peculiar hardship upon the complainant, who had spent £200 in having the electric light fitted to his premises. The fact was that the defendant Company, while they had the monopoly to furnish electricity in Deptford, were also competitors with other companies for the supply of the West of London. What was contended was that during the winter the Company neglected to provide Deptford with electricity while they were supplying the West-end. The result was that this large public-house was left in the dark from something like 4 o'clock to 8.30. Notwithstanding that the supply was lacking, the Company sent a big bill to the complainant. He did not know why Parliament gave such a monopoly to a private Company; and the only remedy consumers had was to ask his Worship to inflict a fine of 40s. on each summons.

Mr. BAILHACHE admitted the failure to supply on certain dates, and quoted the Electric Lighting Orders Confirmation Act, to show that the Company were not responsible for failure due to inevitable accident or *force majeure*. The latter was, he said, foreign to English statutes; and if the Magistrate should be against him, he must ask for a case.

Mr. KENNEDY said he presumed that *force majeure* was practically the same as *actus Dei*.

Mr. BAILHACHE thought it covered more than this.

Mr. *R. S. Bain*, the Company's Managing-Director, gave evidence of the difficulties they laboured under by reason of the failure of contractors to supply boilers to time, as well as to explosions of tubes, which necessitated the withdrawal from use of five or six boilers. The coal supply had been the cause of the difficulty, as the Company had had to accept North-country coal, which was unsuitable for their purpose. In order to provide better for their customers, they cut off wholesale consumers—the Metropolitan Supply Company and the Chelsea Company—and declined after November to take any further orders. When it was impossible to supply everyone, the Company cut off the circuit which would cause the least public inconvenience, and in this circuit Mr. Shoddick was included.

In cross-examination, witness said they had to cut off some circuit, and they deliberately cut off Deptford. In the West-end they had competitors—one Company in every parish. There was another Company having powers in this district; but it was not working. The same state of affairs existed at Southwark, where similar summonses were also pending. Mr. Shoddick's bill for the quarter was £64, in spite of the defective supply.

Mr. BAILHACHE argued that *force majeure* meant not only act of God, but circumstances beyond the control of the Company. The Company made provision for the increase of their business, and he maintained that they could have done no more than they did. Had the Company cut off the West-end when this course was necessary, panic might have been caused in some of the theatres and public buildings.

Mr. LAWLESS argued that *force majeure* did not apply in this case. The Company took customers with their eyes open, knowing that the contract for boilers had been broken.

Mr. KENNEDY said he would give his decision on the 4th inst.

At the Southwark Police Court, a similar case to the one above reported came before Mr. Paul Taylor. In this instance the London Electric Supply Corporation were summoned by the London County Council for having failed to maintain, on certain dates in January and February, a proper supply of electric light to 148, Borough High Street, the Weights and Measures Offices, Union Road, and St. George's Public Library, Borough Road.

At the outset, Mr. BAILHACHE applied for an adjournment. A similar case had, he said, that day been heard at Greenwich, and the Magistrate had reserved his decision. If this were against the defendants, the Magistrate would be asked to grant a case for the High Court. The points raised at Greenwich were practically the same as at Southwark. He relied upon a proviso to section 50 of the Provisional Order granted to the Corporation in 1889, which stipulated that no penalty should be imposed when the Court held that the default in the supply was due to unavoidable accident or *force majeure*, or was so slight as not materially to affect the value of the supply.

Mr. TAYLOR: Is the term *force majeure* often used?

Mr. BAILHACHE: This is the first Act in which I have seen it. If the Magistrate at Greenwich decides against me, I have asked him to state a case on this term; and if you are against me, I shall ask you to do the same. It is important to know what *force majeure* in the English statute means. I think the practical meaning is default without negligence.

Evidence similar to that above reported having been given,

Mr. TAYLOR said that the wording of the proviso pointed clearly to the fact that if there was any negligence at all on the part of the Company, it would be his duty to convict. But had there been negligence? Not the slightest evidence had been given to show it. Yet even, indeed, if there was slight neglect, it seemed, under the circumstances, to be covered by the term *force majeure*. If, on the other hand, it was contended that want of foresight was negligence, how could it be said that the defendants could have foreseen the failure of the contractors to provide their boilers? Or how could it be said that they could have foreseen that the South African war would have caused a shortage in the supply of Welsh steam coal by the colliery owners? On the whole evidence, he had come to the conclusion that he must dismiss the summonses.

A similar case was heard at the Marylebone Police Court. The Metropolitan Electric Supply Company appeared before Mr. Plowden to answer six adjourned summonses, issued at the instance of the Marylebone Vestry and the Marylebone Board of Guardians, for, in the month of December, making default in the supply of electrical energy. His Worship having reviewed the evidence, said the electric light seemed to have flitted over the parish with the fitfulness and brilliancy of summer lightning—one never knew when it was coming. He thought the explanation of the Company as to the failures during the present year exculpated them from blame; and he should not therefore take them into account. On the original summonses, the Company would have to pay 5s. for each date (total, £1 5s.), with 10 guineas costs. His Worship added that the public would be encouraged and consoled by the statement that these failures would not occur again, or at least that they would be few and far between.

The Welsbach and Sunlight Litigation.

Last Saturday, Mr. Justice Byrne gave judgment on a summons which had been argued before him at considerable length, as to the sufficiency of the answers to interrogatories put in by the Secretary of the plaintiff Company. It will probably be recollected that the defendants wished to interrogate certain of the Directors and Mr. Mackean, the plaintiffs' Chemist; but this was refused, and leave given to interrogate the Secretary only (*ante*, pp. 153, 210). The object of the interrogatories was to elicit information as to the receipt by the Incandescent Gaslight Company (the plaintiffs' predecessors) of fluid for impregnating mantles from Dr. Welsbach in 1891 and 1892; and the Secretary, in his answer, said the matters inquired into occurred prior to the incorporation of the plaintiff Company, and that he had no personal knowledge of them whatever. He had made inquiries of the Directors, servants, and officers of the Company as to what knowledge they had acquired on the subject in the course of their employment, and was informed by them that they possessed none; and he was advised that he was not obliged to make inquiries of persons who happened to be at present Directors or officers as to any knowledge they might possess accidentally, and not from their position as officers or agents. His Lordship held that this answer was illusory and insufficient; and he ordered a further answer to be given, but suspended the operation of the order pending an appeal.

Railway Companies and the Increased Price of Coal.—In consequence of the high price of coal, and in order to recoup themselves for the loss sustained thereby, the principal Railway Companies have issued a notice to all firms interested in the coal trade of their determination to charge at once an additional 3d. per ton for the use of all the companies' waggons. They have also decided to make a charge at their coal wharves of 1d. for weighing every vehicle—hitherto performed gratuitously.

Rochdale Corporation Water Supply.—The water undertaking of the Rochdale Corporation had a deficiency of £1357 at the close of the financial year 1897-8; and as the sales of water last year produced £1180 more than in the preceding twelve months, there would have been little or no loss had it not been for changes in the Money Market. A number of loans had run out, and they had to be renewed on terms which mean the payment of considerably above £1000 more interest. The increase in the amount received in water-rentals is made up of £561 for domestic and £619 for trade supplies. The Corporation now draw upwards of £7000 a year for water used for the latter purpose. In spite of the effect on the Water Department of the dearness of money, the present financial position of the old works is quite as good as was anticipated when the Water Bill was being discussed in 1898. The revenue has increased at a greater rate than was expected. However, the Water Committee will require the proceeds of a fourpenny rate in order to be able to square their accounts.

Gas Profits at Blackpool.—At the meeting of the Gas Committee of the Blackpool Corporation on Monday last week, the Gas Engineer (Mr. John Chew) presented a preliminary report on the working of the gas undertaking in the year ending March 25. The quantity of gas sold was 425 million cubic feet; being an increase of 41 millions on the previous year's figures. This is rather more than the annual make in each of the two neighbouring towns of Fleetwood and Lytham. The gross profits for the year amount to £20,000; and, after making allowance for interest, sinking fund charges, depreciation, &c., there remains a surplus of upwards of £12,000, which, as usual, will be placed at the disposal of the Corporation for reducing the rates. The surplus is £1000 more than the previous year's net profit, and is equivalent to a contribution of about 10d. in the pound on the present rateable value of the borough. The effect of the increased price of coal was not felt till the close of the year, when some of the contracts ran out, and further supplies had to be obtained. The results achieved, as shown by the figures given above, furnish another tribute to Mr. Chew's judicious and experienced management.

Street Lighting in Chicago.—The largest municipal street-lighting system in the United States is maintained in Chicago; and its cost is shown by the report of the City Electrician, Mr. Edward B. Ellicott, for the past year. There are 1310 miles of streets lighted—713 miles by gas, 327 by gasoline, and 270 by electricity. The average cost per mile of thoroughfare for the year was $654·48; that for the gas-lighted streets amounting to $784·6, that for the gasoline-lighted streets to $442·48, and that for the electric-lighted streets to $567·45. From an insignificant plant installed in 1887, and capable of furnishing 125 lights, the system has been increased to its present capacity, and is now furnishing a total of 3502 2000-candle lights. The cost of material and labour for the year was $143,709·82, to which was added the expense of replacing and repairing circuits and conduits, bringing up the total cost to $157,486 53. The average number of lamps being 2893, the total cost per lamp was $54·43, or, including office salaries, amounting to $1·50 per lamp, $55·93. The average number of lamp-hours per lamp was 4041; the average cost per lamp per hour, including office salaries, was therefore 1·384c. The average cost of duct in underground construction, where 3-inch vitrified clay tubing with cement joints is used, was 74c. per foot for double conduit work, or 37c. per foot per duct, including manholes and laterals.

MISCELLANEOUS NEWS.

WEST RIDING COALOWNERS AND GAS COAL CONTRACTS.

Protest Against Proposed New Conditions.

The following appeared in the "Leeds Mercury" last Saturday: "We understand that the West Riding coalowners propose to alter the conditions under which they have hitherto supplied gas coal by contract. One of the most important alterations is that the coal contracted for shall be delivered at the rate of 40 per cent. during the summer months—April to October—and 60 per cent. during the winter months. Hitherto Leeds has obtained 73 per cent. of its supply during the winter months; and the change would mean that 13 per cent. would have to be saved from the summer delivery and stacked for winter use. This may seem a slight thing, but it is not so. It would entail the provision of increased storage-ground, the cost of stacking, and the cost of conveyance from the stack. This would not be all. It is well known that the quality of gas coal rapidly and seriously deteriorates by exposure. A moderate computation of the increased cost such a condition would entail is said to be 1s. 6d. per ton on the 13 per cent. This alone would be a material advance for Leeds, whose gas making requires from 300,000 to 400,000 tons per annum. The coalowners, in seeking to impose this condition, evidently desire to have more coal in winter for the ordinary market, in which they would obtain a considerably higher price than they do for contracts. They probably also wish to limit stacking in summer. It is further proposed by them that 'the total or partial failure of any receipt or delivery is not to vitiate the contract as to any other receipt or delivery.' Then, 'each month's deliveries [are] to be paid for in full in cash in each succeeding month;' and 'if the purchaser make default in any payment, the vendors may, at their option, cancel or withhold all future deliveries.' At the close of the municipal year, more than a month elapses between the last meeting of the old Gas Committee and the first of the new; and compliance with the latter condition would therefore require some other arrangement than that which has hitherto been found necessary. A stipulation to which objection is taken is that 'no purchaser shall have a right to demand any fulfilment of this contract out of heaped stock.' The Corporations of Leeds, Bradford, Huddersfield, Halifax, and Keighley recently received an intimation regarding the conditions it was proposed to insert in gas coal contracts by the West Riding coalowners. Grave objection being taken to some of the stipulations, the Corporations appointed representatives to see the coalowners on the matter. The interview took place in Leeds a few days ago. Mr. Currer Briggs conducted the discussion on behalf of the coalowners, and Alderman Lowden, of Leeds, was the spokesman for the Corporations. On the part of the latter, the most serious objection was taken to the change affecting the percentage of coal to be supplied during the winter and summer, and a vigorous protest was made against it on the ground stated above. Mr. Lowden, we understand, plainly told the representatives of the coalowners that the Corporations were strongly opposed to such a condition, and that insistence would simply mean that they would seek to reduce their coal consumption by availing themselves of water gas, with which the coal gas could be enriched. The result of the interview was an arrangement to further discuss the conditions; and on that occasion the Chairman and Vice-Chairman of the Gas Committee, with the Gas Engineer, of each of the five towns named, will represent the Corporations."

RIVER PLATE GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held yesterday week, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. Bowen in the chair.

The Secretary (Mr. Ernest Heald) having read the notice convening the meeting, the report and accounts were taken as read.

The Chairman, in moving their adoption, said the shareholders would probably expect him to say something about the negotiations which the Directors entered into for the purchase of the Rosario Gas-Works, and which the shareholders authorized them to conclude at an extraordinary general meeting on Oct. 30 last. After careful investigation and mature consideration, the Board decided that, as the state of the London Money Market was then so unsettled, and the war news was so discouraging for the moment, they would not be justified in going on with the business in the terms of the proposal they had in hand. They accordingly made the owner, Senor Santa Maria, a counter offer as regards terms of payment, which, however, he declined to accept; and so the business had been allowed to drop. Owing to the plague having broken out in Rosario, things had been very bad there lately; so that the Board did not think they need have any regret in not having accomplished the transaction. Regarding the report and accounts, some of the shareholders might consider the figures a little disappointing, inasmuch as so much profit had not been made as in 1898; but in 1897, they had a gross profit of £80,662, as against £91,408 in 1899. The Directors regarded last year as an exceptionally good one; and so, out of the profits earned, they passed £20,000 to the reserve fund, and £10,000 to the contingency fund. The Government project to fix the official par rate for paper at 44 c. gold, had had the effect of causing the gold premium to advance from 107, at which the Company's paper balances were converted into gold at the end of 1898, to 130; and this adversely affected the accounts, but the contingency fund had not been touched. What, however, had had the most serious effect on the profits had been the falling off in the selling price of coke and other residuals. The total sales of residuals had yielded less by (say) £14,000 odd. The fall in prices was caused entirely by the competition of imported coke. But this had diminished a good deal since the beginning of the year; and better prices were now being obtained. Notwithstanding the great competition in Buenos Ayres, 7·17 per cent. more gas was sold than in 1898. The quantity of coal carbonized was 1900 tons more; and the cost was 4s. 3d. per ton less. The yield per ton of coal was higher than in 1898, though they then considered it extraordinarily good. They had, however, to supply 23-candle power gas; so that it was expensive to produce. During the year they paid in national and municipal taxes, no less than $264,365 paper—an increase over 1898 of $30,550, or nearly £2700. About 13½ miles of mains were added to their system during the year; and the net gain of customers was no less than 1995—making a total of 24,667, though they had to put in as many as 6251 new services to obtain this net increase—so very active was the competition between the Companies. The Electric Light Companies did not do the Company much harm, as they only took from them 16 customers during the year. At the end of last year, they lighted 6780 public lamps, as against 5808 at the close of 1898. After a passing reference to the cordial relations existing between the Company and the Municipal authorities, and a tribute to the ability and energy of the Company's local representatives and officials, he alluded to the extensive revision of the distribution system that had been made in connection with the paving and repaving of the city. In 1899, 32,724 metres of mains were removed and revised, as against 25,142 metres in 1898. The sizes of 6786 metres of mains had been changed; and, in one way or another, 681 metres had been modified. Besides this, 3271 metres had been taken up in streets where they had duplicate mains of the old Argentine and Belgrano Companies. These extensive works had all been charged against revenue; but it was money well laid out. No less than £21,029 was spent out of revenue last year in the upkeep of the works; and they had the authority of their Chief Engineer for saying that everything was in first-class condition. New automatic charging apparatus at the Corrales works had given every satisfaction; and the new workshop for meters had been a great success. During the year 1874 meters were made in it, and 4653 repaired. To pay for various works and purchases of land, a further amount of £30,000 of debenture stock was sold; and consequently the charge for interest had increased from £9702 to £10,441. The capital and expenditure was £34,758, against £26,985 in 1898. It included the cost of additional land at Corrales, part of the cost of a carburetted water-gas installation, the expense of connecting the Corrales works with the main system of sewers so as to get rid of the ammoniacal liquor, and the purchase of a piece of land adjoining the Belgrano works. Among other figures to which he referred was the item of stocks of coal, &c., which stood at £62,998. They had, he explained, rather heavy stocks of coal at the end of the year—sent out, he was glad to say, at cheap freights. Regarding the distribution of the profits, they were able to give the shareholders the same dividend as last year, pass £10,000 to the reserve fund, and carry forward practically the same amount. Looking at all the circumstances—some very exceptional—he thought the proprietors would be well satisfied with this result. Of course, it would be in the minds of the shareholders that the very high prices ruling for coals must very much affect their prospects; but he was pleased to say that so far they had not had to buy any dear coal. They had succeeded in purchasing a very considerable portion of their requirements, of one class of coal, for this year, and also for well into next, at the price paid last year; and of the other class, they fortunately had sufficient contracted for early last year to last them until about September next. So that, if they had to submit to purchase an additional quantity at the high prices, it would not be a very serious matter as regards this year's accounts; and by next year they hoped that matters and prices would have settled down. On the whole, he thought he might assure the shareholders that their prospects were in every way encouraging. From January to date, the consumption of gas had been very satisfactory—better than anything they had ever had before.

Mr. C. P. Ogilvie seconded the motion, which, after a few congratulatory remarks from Mr. C. Surgey, was unanimously carried.

A final dividend at the rate of 8s. per share was declared; making 7 per cent. for the year.

The retiring Directors (Messrs. A. E. Bowen and C. P. Ogilvie) and the Auditors were next re-elected.

A vote of thanks was passed to the London staff, to the Chairman and members of the Local Committee, and to the General Manager (Mr. Gabarret) and the Chief Engineer (Mr. Rowbotham); and similar recognition was made of the services of the Chairman and Directors.

SINGAPORE GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. Samuel Spencer in the chair.

The Secretary (Mr. R. M. Christie) read the notice convening the meeting; and the report and accounts—which were referred to in the "Journal" for the 17th ult.—were taken as read.

The Chairman said he would ask the shareholders to pass the accounts as presented; and at the close of the meeting, he would like to have their views in private as to the reply that should be made to the letter they had received from the Municipality. Turning to the accounts, they would have noticed that they worked out, as regarded the net profit, about the same as in the previous year; and they would remember he stated that this period was the most favourable they had experienced for some years. The shareholders would have observed that the present balance-sheet was different to any that had previously been put before them; as, following what the Board proposed doing last year, the figures had been worked out at nearly their sterling value—the dollar having been reckoned at 2s. 6d, as against 4s. 6d. previously. This would enable the accounts to be better understood by anyone examining them, and it would do away with the enormous amount that had hitherto appeared as loss on exchange. The net profit was £3512, which enabled the Board to recommend a slightly increased dividend—namely, 3½ per cent. for the year, as against 3 per cent. paid for the previous twelve months. The shareholders would remember that, at the extraordinary meeting held in November last, it was agreed to cable to the Municipality that the Company were willing to accept such a sum as Mr. Corbet Woodall (the Engineer consulted by the Commissioners) might recommend; but on Jan. 25 they wrote declining such an arrangement. Since then—namely, on Feb. 15—the Municipality had written saying that they had a promise from the Governor, in council, of a loan for the purpose of establishing municipal gas-works; and they asked the Company to state definitely, on or before April 30, the lowest price they would accept. The shareholders would also remember that at the last meeting the Board unhesitatingly said they considered the works worth, as a going concern, £55,000. They had since seen no reason to alter

their views as to this figure, as, taking the profit for the last two years as averaging about £3500, and multiplying the figure by 16¾ years' purchase —the number of years stated by the Municipal Engineer to be "a fair rate"—the amount would work out at over £58,000. The Commissioners, however, would not see the matter in this light; and they had sent the Company word in their last letter that they would not pay anything like the sum named for the undertaking. It was therefore considered advisable by the Board to ask an eminent gas engineer to give an opinion on the value of the property, so that this could be submitted to the shareholders. They thereupon consulted Mr. A. F. Phillips, who was a great authority on the value of foreign gas-works, and was also known to the Commissioners. Mr. Phillips had submitted a report, in which he stated that he considered a fair price would be £45,000, exclusive of the land. The exact words used by Mr. Phillips were: "I estimate the value of the works and plant to-day, as set out in the report, at £45,000, and am of opinion that the Company will be justified in accepting such an amount, and the Municipality should be willing to pay it." At the private meeting later on, the Board would ask the shareholders to decide what figure should be cabled out as the sum they were willing to accept for the works. He might point out that, at the price named by Mr. Phillips, the rate of profit realized on the past two years' working would give the Municipality a return of 7 per cent., in addition to which they would save the London expenses, which would be equal to certainly another 2 per cent. The result to the Commissioners would be a saving on their rates of at least £1200 to £1500 a year. As the Municipality were really in earnest in the matter of having their own gas-works, the Board were strongly of opinion that it would be wise to try to come to terms with them, and make them an offer such as they could readily accept. The Directors were hopeful that the sum to be decided on by the shareholders as the selling price would be such as the Municipality could fairly agree to give. He would be pleased to answer any questions; but he thought it would be better to pass the accounts as they stood, and defer any discussion till the private meeting. They were fortunate in having Mr. Albert Ford, their Engineer and Manager, present to assist them in coming to a decision in regard to the price they should ask for the works. He concluded by proposing that the report and balance-sheet be received, adopted, and entered on the minutes.

Mr. W. T. Batten seconded the motion.

Mr. S. H. Dean said he would like to know the meaning of the item in the balance-sheet, "Contingent fund, £1000."

The Chairman replied that this was made up of money which, if they had liked, might have been distributed, but which instead was put to reserve and invested in the business. If the Company were to continue in existence, the amount could now be taken from the business and put aside. He added that the Company were never in such a good position as at the present time. They had £2800 in the bank.

The resolution was carried unanimously.

On the motion of the Chairman, seconded by Mr. B. Green, a dividend was declared on the ordinary shares of 4 per cent. per annum, free of income-tax, making, with the interim dividend, 3½ per cent. for the year.

The retiring Director (Mr. R. Garraway Rice) and the Auditors (Messrs. Magnus Ohren and Thomas Guyatt) having been re-elected,

Mr. Robbins proposed, and Mr. H. W. Smith seconded, a vote of thanks to the Directors.

On the motion of Mr. Dyer, seconded by Mr. Samuel While, a similar vote was passed to the Engineer and Manager.

Mr. Ford, in returning thanks, said he thought too much credit had been given to him personally for the great improvement that had taken place in the Company's position. The Directors had done a lot towards this end. He was glad that, in spite of the increased cost of coal, labour difficulties, and the loss on exchange, they had managed to make a little improvement; and he congratulated the shareholders on the fact that the dividend had been increased.

The proceedings then terminated.

MANCHESTER CORPORATION GAS SUPPLY.

Local Government Board Inquiry.

An inquiry was held at the Manchester Town Hall last Tuesday, by Mr. E. A. Sandford Fawcett, relative to an application made by the Corporation to the Local Government Board for sanction to borrow £250,000 for the purposes of their gas undertaking.

The Deputy Town Clerk (Mr. T. Hudson) explained that the Act of Parliament under which the application was made was that of 1899, by which the Corporation were empowered to borrow an additional sum of £500,000 with the sanction of the Local Government Board; and they now asked for power to borrow the first half of this amount. The principal works included in the application were at the Bradford Road station—the largest of the three stations in the city. It was proposed to erect new plant for testing coal and cannel, which would be permanent. The cost was estimated to be £5500. The other items he explained to be the following: Completion of the arching and culverting of the River Medlock (which flows through the works) over a length of 184 lineal yards, at an estimated cost of £11,500; at the Poland Street pipe-yard, buildings comprising a storekeeper's house, mess-rooms for men engaged in the yard and the streets, and stables, the estimated cost being £12,930; the Whitworth Street storage yard to be enclosed with a boundary wall, and sheds to be erected for the storage of mains and pipes, estimated to cost £1930; and land £3570. The next item in the loan was one of £80,000 for the extension of the gas-mains in the city; and of this the sum of £20,665 was for trunk mains and the rest for service mains. The next item was for meters, the use of which was increasing, due to the fact that the Corporation did not make any charge for hiring. The sum estimated to be required in three years was £100,000. The last item was for stores—£34,570. With regard to the item for land, he took it for granted that a term of 50 years would be allowed for repayment of the loan; and as to the substantial works enumerated, he asked that the Local Government Board would grant a period of 40 years. On previous occasions, only 30 years had been allowed; but this was thought to be too short a term. The buildings were substantial and likely to last 50 years, and it was considered reasonable that a term of 40 years should be granted. In regard to the smaller pipes, he asked for a term of 25 years. It would be more convenient to the Corporation if an equated term were granted. As regarded the meters and stoves, he did not ask the Inspector to equate these with the other items. Formerly they had had the short term of five years for this class of loan; but they thought this very inadequate. They had a guarantee from the makers of meters which extended over five years. The "life" of a meter was nearer 20 years than five; and they asked for 15 years. As regarded the stoves, they asked for seven years, and not five as previously. They admitted that the "life" was not so long as that of the meters.

The Right Hon. *Thomas Briggs* (the Lord Mayor) having given formal evidence in support of the application,

Mr. *Charles Nickson*, Superintendent of the Gas Department, said that during the past five years 18,200 new houses had been erected in the area supplied by the Committee. In 1881 the city population was 341,000, in 1891 it was 505,000, and in 1900 it was estimated at 550,000. The total population of the area of supply was now estimated at 709,000, and there were 126,191 consumers. The increase in the use of gas had been very great in recent years. In 1890 the consumption was 2973 million cubic feet, in 1898 it was 4158 millions, and in 1900 it was estimated to be 4520 millions. The increase in the past five years had been at the rate of 5 per cent. per annum. Altogether, the department had borrowed £2,576,000; and the present debt was £1,026,450. The property of the department was estimated to be worth £2,123,784. The total income for the past year was £643,000, against £523,000 in 1896. There had been an expenditure of about £98,000 a year for the past five years on extensions; and he considered that the developments of the next five years would be quite as great.

Mr. *J. Swarbrick*, Architect, and Mr. *W. C. Waddington*, Superintendent of the Street Mains and Lighting Department, furnished details of the works proposed, and information showing their necessity.

Mr. *T. De Courcy Meade*, the City Surveyor, was also called, and gave evidence as to some of the works required.

Mr. *J. Gibson Newbigging*, the Engineer of the Gas Department, said that, notwithstanding the great demand for the electric light, the consumption of gas maintained a steady average increase of about 5 per cent. per annum; and this rate was likely to be kept up. It was largely due to the constantly growing demand for prepayment meters, and for gas for purposes other than lighting. He supported the various proposals laid before the Inspector.

The inquiry concluded; and the Inspector afterwards visited the various sites mentioned.

Tenders under Consideration.

At a meeting of the Gas Committee of the Manchester Corporation held last Friday, a number of tenders for new plant, tar, &c., were considered; but no definite decision was arrived at as to their acceptance or otherwise. It was, however, decided to advertise for the requisite supplies of gas coal and cannel to meet the ensuing year's requirements. Although the Committee anticipate that they will have to pay a considerable increase in the price of coal, especially in view of the firm attitude the coalowners are adopting, they have not decided on any recommendation to the Council as to an increase in the price of gas to consumers. This question will, however, probably be settled at the monthly meeting of the Council to be held to morrow (Wedne day). In the meantime, it is interesting to note that the Gas Department are securing some compensation for the increased cost of production in the better prices they are getting for coke; and at Friday's meeting the Committee decided to further raise the price from 16s. 8d. (the present figure) to 18s. 6d. per ton—the advance to come into effect to-day.

THE ANNEXATION OF GAS UNDERTAKINGS BY BRADFORD.

The negotiations which have been going on between the Bradford Corporation and the North Bierley Gas Company for the purchase of the Company's undertaking by the City Authority have, it is reported, been practically completed. A good deal was done towards that end when, a short time ago, the parties were in London; and it was reported at a meeting of the Finance and General Purposes Committee last Friday that satisfactory arrangements had been arrived at. When the North Bierley district was included in the city boundaries, it was agreed that the rates in that district should remain at 4s. 10d. in the pound until such time as the gas was supplied at the price charged by the Corporation. This arrangement has, no doubt, led to special efforts being made to come to terms with the North Bierley Company. The terms agreed to are based upon a thirty-one years' purchase; the Corporation acquiring the whole of the Company's area of supply excepting the districts of Scholes and Oakenshaw. These districts will, no doubt, eventually be handed over to the Cleckheaton District Council, with whom negotiations are going on for the transference of that area. At present, however, there is a difference of opinion with regard to the purchase price. The price of gas at North Bierley is now 2s. 11d. per 1000 cubic feet, while the price charged by Bradford is 2s. 3d. per 1000 cubic feet, with certain discounts, varying according to the amount of gas consumed. Terms had not at the end of last week been agreed upon between the Corporation and the other Companies supplying gas in the newly-added districts.

OPENING OF GAS-WORKS AT SELSEY.

In February last year a Company was floated, with a capital of £10,000, to provide a supply of gas for the watering-place of Selsey, in Sussex; and in August the erection of works was commenced. The undertaking was pushed forward with such dispatch that on Saturday, the 21st ult., the Directors, officials, and a few friends, met together, and witnessed the ceremony of turning on the gas. The works occupy a site on land acquired by Mr. Newton Clayton, 2 acres having been secured by the Company, of which one-half is at present made use of; the other being available for extensions. The plant is capable of supplying 5 million cubic feet of gas a year; and this output may be doubled with very little structural alteration. Mr. A. F. Painter was the Engineer employed;

and Messrs. Williams and Carnall were the Contractors. Messrs. Newton, Chambers, and Co., Limited, supplied the apparatus; and Messrs. W. Parkinson and Co., the governor. Four miles of pipes have been laid in the district; and as the business grows, they will be extended by six miles. The price of gas at the outset is to be 5s. per 1000 cubic feet; but it is intended to freely introduce the prepayment system. The gas was turned on by Mr. E. R. Painter, Chairman of the Company, after which the party adjourned to the new Selsey Hotel, where luncheon was partaken of. Mr. E. R. Painter presided; and Alderman Ballard, of Chichester, was in the vice-chair. At the conclusion of the repast, several appropriate speeches were made; hearty good wishes being expressed for the success of the undertaking. Mr. Newton Clayton gave the toast of "The Selsey Gas Company," which was responded to by the Chairman, who dealt with the prospects of the concern. During the evening, several designs, illuminated by gas, were on view in Selsey.

BRUSSELS MUNICIPAL GAS SUPPLY.

The Gas Committee's Report on the Past Year's Working.

According to the report of the Gas Committee of the Brussels Municipality for the past year, which has lately been presented, the total quantity of gas sold was 31,474,415 cubic metres, or about 1,111,047,000 cubic feet, compared with 29,252,661 cubic metres, or about 1,032,619,000 cubic feet in 1898; being an increase of 2,221,754 cubic metres, or 78,428,000 cubic feet. This is a considerably larger increase than that recorded in last year's report (for the year 1898) as compared with 1897. The total production of gas in the past twelve months reached 38,724,160 cubic metres (1,366,962,848 cubic feet); being 2,181,280 cubic metres (76,999,184 cubic feet) more than in 1898. The entire bulk of gas was disposed of as follows:—

	Cubic Metres.
Ordinary consumers	24,721,512
Municipal establishments, at 10c.	1,030,782
Gas-engines, at 10c.	2,104,763
Industrial purposes, at 10c.	1,323,710
Heating purposes, at 10c.	1,063,958
Illuminating devices, balloons, &c.	98,487
Artizans' dwellings and miscellaneous	1,131,203
Total sold	31,474,415
Public lighting and illuminations	4,999,760
Used on the works, &c.	1,182,989
Unaccounted for	1,066,996
Total production	38,724,160

It is interesting to notice that the use of incandescent burners and the extended adoption of electric lighting have not had the effect of checking the growth of the gas consumption. This is strikingly shown by a diagram accompanying the report, from which it is seen that the output of gas in the winter months has increased during the past twenty years by 125 per cent., while that for the summer months has actually gone up by more than 200 per cent. The total number of inhabitants is now 208,987; the consumption per head being about 5300 cubic feet, and the average price 2s. 9d. per 1000 cubic feet.

The total receipts amounted to 6,336,795 frs. (£253,472), and the expenses to 4,228,645 frs. (£169,146)—leaving a balance of 2,108,150 frs. (£84,326), compared with 1,762,354 frs. (£70,494) in 1898. Allowing 41,304 frs. for the reduced value of the stores, the profit resulting from the undertaking is 2,066,846 frs. (£82,674).

The section of the report dealing with the manufacturing operations shows that 122,273 tons of coal were carbonized and 1344 tons of oil employed for enrichment. For 1898, the figures were 118,682 and 900 tons respectively. The quantity of coke sold at the works was 852,458 hectolitres (about 2,344,260 bushels), and the whole of the stock was disposed of. All the tar products were sold regularly, at fairly remunerative prices. Sulphate of ammonia fetched a higher figure, and there was none in stock at the end of the year. As usual, the breeze was utilized in the manufacture of compressed fuel, which is employed in heating the retorts and generators. In view of the augmentation in the consumption of gas, the new works in course of construction, as mentioned in a paragraph which appeared in the "JOURNAL" a few weeks since, have been pushed on as fast as possible. These works are expected to be in operation some time during the current financial year.

The total amount of capital employed in the undertaking at the close of 1899 was 24,989,291 frs. (£999,572), compared with 23,489,453 frs. (£939,578) at the corresponding period of 1898. Mains to the extent of 187,425 metres (206,167 yards) occupied the subsoil of the city on Dec. 31, 1899, compared with 186,882 metres (205,570 yards) at the end of 1898. The leakage amounted to 2·75 per cent. of the total quantity of gas sent out, against 3·24 per cent. in 1898. The number of meters in use was 26,809—an increase of 2360. There were 425 prepayment meters fitted up; making a total of 2146 meters of this kind in use in the city. In 1898 the number put in was only 290; so that the report bears evidence that this convenient method of obtaining a supply of gas is appreciated. It will be seen from these figures that there was renewed activity in the interior fitting work, which had slightly fallen off; the number of orders received being 1503 against 947 in 1898. At the close of the year, there were in use 7706 of these interior installations, as well as 3534 rising pipes—an addition of 497 of the latter in the year. The gas-stoves on hire numbered 17,973, against 14,729 in 1898 and 13,038 in the preceding year; and 367 gas-engines, representing 3088-horse power, were at work—the larger number of them being in printing and bookbinding establishments. The consumption of gas for motive power rose last year to 2,104,763 cubic metres, or about 74,298,000 cubic feet. Outside lanterns are let to private consumers; and 22 single jet and 130 high-power lamps were in use on Dec. 31, 1899. This was a slight falling off as compared with 1898. For the public lighting there were employed 6349 lamps, of which 697 were fitted with high-power burners. The total number of hours of lighting was 3815. Between midnight and one o'clock in the morning, 670 high-power and 1137 ordinary burners were turned off during the year.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1114.

Issue.	Share	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p. c.	20—21	..	5 0 0
100,000	10	,,	7½	Do. 7 p. c.	13¼—14½	..	5 3 5
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	6¼—6¾	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4¼—4¾	..	5 1 1
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250—260	..	4 12 4
270,000	,,	,,	9	Do. New	195—200	..	4 10 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	118—123	..	3 5 1
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	237—242	..	4 15 0
226,320	,,	,,	8½	Do. A. Ord. Stk.	180—185	..	4 11 11
999,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	41½—42½	..	4 13 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c.	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p. c.	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9⅜—10½	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	99—101	..	3 19 3
150,000	20	Mar. 14	8½	Cagliari, Ltd.	24—26	−1	6 6 11
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	14—15	−⅛	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 11	13⅛	Commercial Old Stock	295—300	..	4 10 0
236,425	,,	,,	10½	Do. New do.	230—235	..	4 9 4
288,237	,,	Dec. 14	4½	Do. 4½ p. c. Deb.	142—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	160—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p. c. Pref.	175—180	..	3 17 9
51,600	Stk.	Feb. 23	14	Croydon A 10 p. c.	335—340	..	4 2 4
173,400	,,	,,	11	Do. B 7 p. c.	265—270	..	4 1 5
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p. c.	118—123	..	4 5 4
60,000	,,	,,	5	Do. 5 p. c. Pref.	133—135	..	3 14 1
486,090	10	Jan. 26	11	European, Ltd.	19½—20½	..	5 7 4
854,060	10	,,	11	Do. £7 10s. paid	14½—15½	−⅓	5 6 5
14,993,075	Stk.	Feb. 9	4⅜	Gas-light and Coke	4 p. c. Ord.	..	4 15 1
2,600,000	,,	,,	3½		3½ p. c. max.	..	3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	..	3 6 8
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	..	3 0 0
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental	210—213	−1	4 13 11
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red.	100—103	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd.	4½—5½	..	5 9 1
560,000	100	Apl. 2	5	Met. of Melbourne	5 p. c. Deb.	..	4 11 9
250,000	100	,,	4½		4½ p. c. Deb.	..	4 4 1
541,920	20	Nov. 15	3	Monte Video, Ltd.		−½	5 4 4
667,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.		..	4 4 1
299,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.	104—107	..	3 5 5
150,000	5	Nov. 30	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 23	7	Ottoman, Ltd.	5—5¼	..	6 7 3
500,000	100	Dec. 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102—106	..	5 13 2
851,070	10	Apl. 27	7	River Plate Ord.	10¾—11¼*	..	6 4 5
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	100—104	..	3 18 5
250,000	10	Apl. 11	8	San Paulo, Ltd.	11½—12½	..	6 8 0
135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
5,600,000	Stk.	Feb. 23	5⅝	South Metrop., 4 p.c. Ord.	128—131	−2½	4 1 5
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb.	99—101	..	2 19 5
380,940	Stk.	Nov. 30	5	Southampton Ord.	117—122	..	4 2 0
70,825	,,	Dec. 29	4	Do. 4 p.c. Deb.	120—125	..	3 4 0
120,000	Stk.	Mar. 14	6	Tottenham and A. 5 p.c. B. 3½ p.c.	139—141	..	4 5 1
250,520	,,	,,	4½		100—102	..	4 8 3
55,100	,,	Dec. 14	4	Edmonton 4 p. c. Deb.	113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	101—104	..	4 16 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.	305—310	..	3 11 0
150,000	,,	,,	5	Do. 5 p. c. Pref.	157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145—150	..	3 0 0
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
1,720,560	Stk.	Apl. 11	7	East London, Ord.	195—200	..	3 10 0
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb.	93—101	..	2 19 5
700,000	50	Dec. 14	7½	Grand Junction 10 p. c. max. 4 p. c. Deb.	106—108	..	3 9 5
810,000	Stk.	Mar. 29	4		130—135	..	2 19 3
708,000	Stk.	Feb. 23	14	Kent	307—312	..	4 9 9
160,000	,,	,,	7	Do. New, 7 p. c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.	294—299	..	3 10 3
406,200	100	,,	8	Do. 7½ p. c. max.	212—217	..	3 13 9
850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	130—133	..	3 0 2
500,000	100	Feb. 23	13½	New River, New Shares	418—423	..	3 3 9
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb.	132—137	..	2 18 5
902,300	Stk.	Dec. 14	7½	South-wark Ord. 7½ p. c. max. 5 p. c. Pref. and	200—205	..	3 13 2
126,500	100	,,	7½		190—195	..	3 16 11
489,200	Stk.	,,	5		160—165	..	3 0 7
1,019,585	,,	Apl. 11	4	Vauxhall 4 p. c. A Deb.	129—134	..	2 19 9
1,155,066	Stk.	Dec. 14	10	West Middlesex	287—292	..	3 8 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	147—152	..	2 19 3
200,000	,,	Mar. 14	8	Do. 8 p. c. Deb.	99—101	..	2 19 5
					*Ex div.		

ELECTRIC LIGHTING NOTES.

The Board of Trade have intimated to the Vestries of St. George's-in-the-East and Mile End Old Town and the District Board of Works of Limehouse that they propose to grant the applications of these Local Authorities for Provisional Orders. They were opposed by the County of London Company, who already possess electric lighting powers for these districts.

A Local Government Board inquiry was held at Rhyl last Thursday, in regard to an application by the Corporation for sanction to borrow £12,250 for electric lighting purposes and £6750 for a refuse destructor. In support of the application, the Town Clerk stated that Rhyl was so rapidly developing that it was absolutely necessary a refuse destructor should be provided; and in order to be up-to-date, the Council had decided to erect electric light works. It was calculated that a substantial profit would be made out of the electric light; but, in addition, the Council would supply the Rhyl and Prestatyn Light Railway with electricity to the advantage of the town.

A fire, which caused considerable alarm, broke out last Saturday afternoon, at the residence of Lord Battersea, Surrey House, Marble Arch. A workman, who had put an installation of electric light into the large oak-room, proceeded to test his work, with the result that the wires, being in contact, set the oak ceiling on fire, and the wood burned rather fiercely. The alarm was at once given, and the domestic fire-extinguishing service was brought into working order. Meanwhile, part of the oak panelling was torn down to prevent the spread of the flames, and some valuable pictures were removed. When the hose was turned on to the flames they were promptly subdued, so that when the Fire Brigade came upon the scene their services were not required. The damage done by the flames was not great, but a very considerable amount was caused by the water.

At a special meeting held last Friday, the Weymouth Town Council had under consideration an elaborate report by Professor A. B. W. Kennedy on a proposed scheme of electric lighting for the borough, together with a supplementary report by his partner, Mr. Jenkins. Professor Kennedy's estimate for the plant is £38,300; to which must be added the cost of land, engineering charges, &c. He therefore assumed that the amount to be borrowed for carrying on the scheme will be £42,000. He reckons that in two years from the start the income from the undertaking will be £5625; and the expenditure, including capital charges, £5000—leaving a balance of £625, besides a saving of about £750 in the cost of gas, making together £1375. He considers, however, that the undertaking will actually pay its way, including capital charges, within the first complete year of working. The report was adopted, and it was decided to instruct Professor Kennedy to prepare a scheme in accordance therewith, together with the necessary plans and details for submission to the Local Government Board, in order to obtain their consent to the raising of the amount required. A proposition was brought forward to call a public meeting to obtain the ratepayers' consent to the scheme; but it was rejected, on a division, by 13 votes to 5.

The Town Council of West Bromwich having applied to the Local Government Board for sanction to borrow £30,000 for purposes of electricity, an inquiry into the matter was held last Friday, at the Town Hall, by Mr. G. W. Willcocks, M.Inst.C.E. Mr. A. Caddick (Town Clerk) represented the Corporation; and among those present were Mr. A. D. Greatrex, the Borough Surveyor, and Mr. R. Quinn, the Electrical Engineer. The Town Clerk explained that the application was chiefly to obtain money for acquiring land, erecting buildings and the requisite machinery, and laying mains in the compulsory area for the purposes of power distribution and electric lighting. This area comprised the main thoroughfare of the town, and a site for the works had been purchased at a cost of £1250. He had received a letter from the Board of Trade containing their requirements, to which the Corporation had assented; but the formal sanction of the Board had not yet been obtained. Mr. Quinn gave details of the scheme, and pointed out that the Corporation proposed to generate a much smaller quantity of electricity than the present demand. They estimated that the total annual revenue would be about £3756, and the expenditure £3348, which would leave a small surplus. There was no opposition to the application.

A deputation from the County Councils Association and other local bodies waited upon Mr. Ritchie at the Board of Trade last Thursday, in reference to the Electric Lighting Act, 1882, Amendment Bill, which seeks to affirm the principle that public authorities ought not to incur any additional trouble and expense in rebuilding or repairing any of their bridges merely because a company have been permitted to utilize the bridge for carrying their electric mains or pipes. The provisions of the Bill are analogous to those contained in the Tramways Act (33 & 34 Vict., cap. 78, sec. 32) with respect to roads. The deputation having laid their views before Mr. Ritchie, he, in reply, said the principle for which the deputation asked appeared to be a reasonable one, although some objection might be taken to its being retrospective. It was rather a strong order to say, when Acts of Parliament and Provisional Orders had been obtained by electric lighting concerns under protection of the existing law, that they should now be made liable under the Bill to expenses to which they were not previously liable. The Bill, which was very defective, had a most unfavourable position in the House; and he suggested that it would be better if it were withdrawn and reintroduced in an amended form. The position of electric lighting was not what it was in 1882; and he thought that the deputation would have a strong case if they went to Parliament and asked for a reconsideration of the position in which local authorities were placed in connection with all such expenses as those in question.

Notwithstanding the opposition of the Marylebone Vestry, and the fact that a new governing body—the Marylebone Borough Council—will come into existence in November, the President of the Board of Trade has granted to the Marylebone Electric Supply Company a Provisional Order conferring upon them the right to supply current in the parish in competition with the Metropolitan Electric Supply Company. Dr. J. Fletcher Little, who, it may be remembered, introduced the deputation which waited upon Mr. Ritchie on the 17th of January last (*ante*, p. 214), in communicating this fact to the Press, says that, as far as the ratepayers are concerned, the only hope is that Parliament will not confirm

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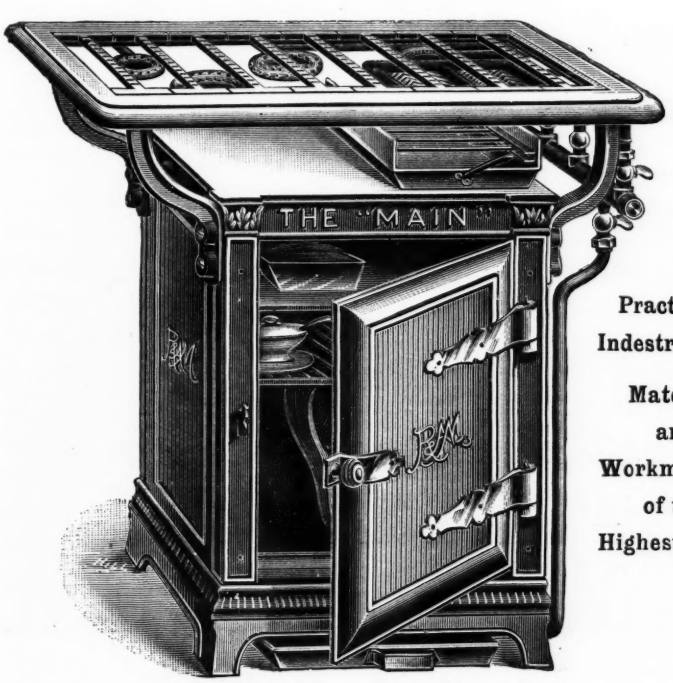

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his action. He proceeds: "Mr. Ritchie's view is that the competition of another Company will diminish the evils from which we at present suffer. This is not so. There is no certainty that it will even reduce the present exorbitant prices. Understandings and working arrangements as to what they deem fair charges are well-nigh certain between two monopolist Companies—they are so clearly to their interest. As to damages for breach of duty in failure to supply, the existence of another Company will not alter the law in favour of the consumer. He will remain, as at present, without any compensation. Further, the ordinary ratepayer will soon become aware that another body has obtained the right to tear up the streets and obstruct the traffic. The influential deputation of ratepayers asked Mr. Ritchie to do two things—first, to give the consumer a legal right to damages for breach of duty on the part of the Company; and, secondly, to exercise his powers to reduce prices. Mr. Ritchie informed the deputation that he believed that, had the evidence then brought forward been laid before the Committee of the House of Commons, the Provisional Order of the Vestry would have been confirmed. Now, the Vestry, in opposing the granting of the Provisional Order to the Marylebone Company, informed Mr. Ritchie of their intention to apply again for a Provisional Order supported by the evidence which he considered so conclusive. No one can doubt that Mr. Ritchie's action is intended to get rid of the responsibility placed on him by Parliament to see that the consumers are fairly dealt with. The statement that the consumers have no remedy in damages he met by a blank denial; but I believe he has since been convinced, by the opinion of eminent Counsel forwarded to him, that he was wrongly advised on this point, and that the members of the deputation were, unfortunately, right. As regards the desire that the Vestry or its successor, the new Council, should have a Provisional Order, it is lamentable to see Mr. Ritchie adopting a course which, should it prove successful, will confer on the shareholders of a Company a gift of considerable money value, which ought to be in the hands of the ratepayers of Marylebone."

THE RATING OF RESERVOIRS.

Conference of Representatives of Local Authorities.

At the Cannon Street Hotel, last Wednesday, a conference of representatives of Local Authorities in the counties of Middlesex and Surrey was held for the purpose of discussing the best means of obtaining an alteration of the law relating to the assessment of reservoirs to the general district rate in urban districts and to the special expenses rate in rural districts. The initiative in the matter was taken by the Sunbury Urban District Council, whose Clerk (Mr. C. E. Goddard) had convened the conference by circular; and the following places were represented: Barnes, Brentford, Edmonton, Enfield, Esher and the Dittons, Hampton, Molesey (East and West), Staines, Sunbury, Twickenham, Walthamstow, and Walton-on-Thames. Delegates from the Middlesex and Surrey County Councils were also present. Mr. W. Harris, J.P., Chairman of the Sunbury District Council, presided.

The Chairman, in opening the proceedings, stated that the initiative in the matter before the delegates had been taken by Sunbury; but Hampton had borne the burden of carrying the question to the House of Lords, and judgment had gone against them. The present meeting was a continuation of the one originally held; and he believed they all felt the absolute injustice of the law as it now stood in regard to the rating question. But it was useless to sit still while an Act of Parliament stood over them which stated that the reservoirs for which they claimed the full rating were only "land covered with water." He should be glad to hear any suggestions; and he felt that it was essential that they, as representatives of the various districts, should annoy and worry somebody, if anything was to come of it. The main point was how to get the money with which to carry on the agitation. Perhaps the Local Government Board could provide funds; but if the Councils acted on their own responsibility, there were such things as surcharges, though he had no very great dread of them himself.

Mr. Goddard read a letter received from Sir F. Dixon-Hartland, Chairman of the Thames Conservancy Board, in which he said he considered the existing law a scandal. He thought, however, that, unless a number of public bodies took up the matter, and endeavoured to get some amendment, a private member was utterly helpless. He was glad the Sunbury District Council had taken steps to unite these bodies; and anything he could do to put an end to the present crying injustice, either in the House of Commons or elsewhere, he would be glad to do. Mr. Goddard also submitted a statement he had prepared, which showed the losses to Local Authorities in consequence of the rating of reservoirs at one fourth their value. The figures were as follows: Hampton, £1862 (rateable value of the reservoirs £12,422); Barnes, £1604 (£9509); Esher and the Dittons, £782 (£5758); Sunbury, £794 (£5296); East and West Molesey, £469 (£5086). In answer to a question, he said the rateable values quoted did not include buildings and machinery.

Mr. Croysdale (Middlesex County Council) said he had been in conversation with Mr. Littler, the Chairman of the Council, and found he was in agreement with him that the law as to the rating of reservoirs should be altered. He agreed that as it now stood it was nothing less than legalized robbery. There were, no doubt, difficulties in their way. The scheme would have to be very comprehensive, and all the districts covered by water-works in the country should be asked to join them, as it was unfair for the fight to be confined to the districts of the Thames Valley. Of course, they would not include some of the towns in the North, where the water-works formed part of the corporation property. In his opinion, there was no reason why reservoirs should not be rated equally with machinery of every kind. There was the question of cost. A Private Bill, if opposed, as, of course, it would be, might land them in costs amounting to £20,000. This outlay, however, could be easily met if the whole country took up the dispute.

Mr. Allbliss (Hampton) opposed the spending of the large sum named, and said he thought a strong representation to the Local Government Board would be the best course to pursue. They demanded an alteration of the law as a right.

Alderman Burt (Surrey County Council) thought it undesirable to go

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too far afield in their operations, as it would tend to complications, and the Committee would prove unworkable. He was not alarmed at the £20,000 mentioned; but he did not consider the question one which should be dealt with by a Private Bill. He thought if £200 were subscribed, it would go a long way to meet the initial expenses; and they might induce Sir F. Dixon-Hartland to bring in a short Bill and introduce a deputation.

Mr. GREENING (Esher and the Dittons) supported the suggestion of a deputation to the Local Government Board, who, he thought, were the proper people to promote the Bill.

Mr. SANDERS (Hampton) said the question was not one relating to the rating of reservoirs only, as the Water Companies also claimed exemption from the full rate in respect of their filter-beds. He thought the meeting would agree with him that it was only right to ask for a fair rating of property held for commercial purposes; and he believed a deputation to the Home Secretary might have some effect.

Mr. J. H. SCOTT (Sunbury) said he found that, under section 211 of the Public Health Act, 1875, it was not competent to repeal any of its provisions by private action; and he might remark that the law under which they were suffering would never have passed if municipal feeling had been as active then as it is at present. He could only add to what had been said that the Water Companies made an average profit of 43 per cent.; and to have their trade warehouses assessed at a quarter their value was a public scandal. He proposed the following motion: "That, having regard to the decision of the House of Lords in the case of *The Hampton Urban District Council v. The Southwark and Vauxhall Water-Works Company*,* that a wholly artificial reservoir constructed and used by a Water Company for the storage of water is merely 'land covered by water' within section 211 of the Public Health Act, 1875, and is accordingly rateable to the general district rate in urban districts and the special expenses rate in rural districts at only one-fourth of the full rateable value, this meeting is of opinion that such a state of law is unjust and ought to be amended."

Alderman BURT suggested the following addition: "And that an Association be formed of representatives affected, or likely to be affected, by the present method of assessment of reservoirs and water-works. That the Association apply to the Secretary of State for the Home Department and the President of the Local Government Board to bring in a Bill to amend the law on the subject, and, if necessary, to authorize local authorities to expend a reasonable sum in support of the object in view. That a Committee be appointed to give effect to this resolution, with power to add to their number."

The motion, as amended, was carried unanimously; and it was decided to forward a copy to each Council, who should be requested to send one delegate each, with two each from the County Councils of Middlesex and Surrey.

The thanks of the meeting were accorded to Mr. Harris for presiding and to Mr. Goddard for his services as Clerk to the conference; and the proceedings closed.

* See "JOURNAL," Vol. LXXIV., p. 1380; and *ante*, p. 89.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At a meeting of the Dundee Town Council on Thursday, the subject of the coal contracts for the gas-works was under consideration. Ex-Provost Ballingall, Convener of the Gas Committee, said the Sub-Committee had been considering the question of the contracts, and notwithstanding the increased price of coal at present compared with that ruling last year, they had unanimously decided to recommend that 55,000 tons be purchased. At the present time, they had 12,000 tons in stock; and the purchase they proposed would bring up the stock to 67,000 tons. They had this year used 64,000 tons, which would leave 3000 tons in stock at the close of the year. The average price last year was 15s. 7d. per ton; and it was now 19s. 2d.—showing an increase of 3s. 7d. per ton. This represented a total of £9800, or something like 4d. per 1000 cubic feet of gas. They could buy a few thousand tons from time to time, as was required. They did this last year, when they only purchased 48,000 tons at the beginning of the year. Since then they had bought 12,000 tons, as opportunity offered. They lost about 1s. 6d. per ton upon last year's prices. They were finishing this year with 12,000 tons of coal in stock; and the question for them was whether they should arrange to complete next year with a large stock of dear coal. He thought it would be wise to finish with a small stock. Mr. William Longair said there was a very decided opinion that coal would be cheaper in August and September; and most of the large users were acting on this principle. He did not think they would be taking any great risk if they bought six months' supply instead of twelve. Lord Provost Hunter said he understood, from the information laid before the Committee, that exactly the reverse was expected. Mr. J. M. Nairn pointed out that some of the offerers for the contracts were persons with whom they had had trouble. He did not think that anyone who had given trouble in one department should be allowed to offer in another. He thought they should have some information as to the various qualities of the coal. Ex-Provost Ballingall said it would be very indiscreet to place the price and the analysis upon a sheet. If they did so, he had no doubt that a good many of the contractors would decline to offer. It was explained that all the contractors had completed their contracts, and that there had been no trouble with any of them. The proposal of the Committee was agreed to.

The Perth Gas Commission on Monday met to consider the matter of the appointment of a Gas Manager. Lord Provost Macgregor presided. From the terms and conditions, it appeared that the applicant must be a competent engineer, able to prepare specifications, drawings, and estimates of costs for any extension to the gas-making plant and works, and to superintend the carrying out of any extensions at the gas-works; and that he must reside in such a part of the burgh of Perth or district as the Gas Committee would approve or require, and devote the whole of his time to the discharge of the duties appertaining to the appointment, and not absent himself from the burgh without the consent of the Chairman of the Gas Committee. The salary offered is £300 per annum

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(meantime without house or other emoluments); and the appointment might be terminated at three months' notice on either side. The Corporation retain in their service as Consulting Gas Engineer Mr. Thomas Whimster, who for 44 years was Manager of the gas-works; but he will take no active part in the management, and will only advise on matters when requested by the Committee to do so, and where they might consider his long experience of special value. From a minute, it appeared that the terms and conditions had become the finding of the Gas Commission in Committee. Mr. Watson moved the adoption of the resolution come to in Committee. In doing so, he said they had got an idea of what were the qualifications, emoluments, &c., of gas engineers from eighteen different corporations; and they had decided to advertise for a gentleman both as Engineer and Manager. It was most desirable that the Manager should have his house on the works. Ex-Bailie Wright seconded. Mr. Wotherspoon moved, as an amendment, that the words "meantime without house or other emoluments" in the terms and conditions should be deleted, and held that £300 was quite a sufficient salary, and did not require any other inducements. Mr. Grieve seconded. After a long discussion, a division was taken, when 12 voted for the amendment and 10 for the motion.

The Commissioners also disposed of an item of business of equal importance—the arrangements for carrying on the works during next winter. Mr. Watson moved that an additional lift be added to the wire-rope guided gasholder at the Shore. He pointed out that Mr. Foulis and Mr. Gillespie had both been consulted, and were of opinion that it was absolutely necessary for another lift to be added to one of the holders, owing to the enormous increase of consumption during the past year. Ex-Bailie Wright seconded. He said that, in Committee, they had been told that there was a debt of £190,000 resting on the gas-works, and that because of this they should pause ere they proceeded to spend the additional sum indicated. He should like to point out that nearly £100,000 was taken up with annuities, over which the Commissioners had no power to help themselves. He also remarked that when the Town Council of Perth took over the gas-works the charge for these annuities upon each 1000 cubic feet sold was 1s. 3d. At the present time, the charge did not amount to 4d. per 1000 cubic feet, showing that by the expenditure of money they practically saved money. Last winter they had a great hue and cry about bad gas and little of it. Next winter evidently, from the remarks of Mr. Watson, unless they were prepared to do something in the direction proposed, the cry would be even louder. It had been suggested to spend £320 on additional retorts; but last winter a very much superior quality of coal had to be used at the gas-works, and there again they could have saved a great expenditure had there been more retort power. Councillor Anderson moved, as an amendment, that they delay proceeding with the erection of this lift. He was more than astonished at the spendthrift policy of some members of the Council—more especially in reference to the gas-works. They had already £191,399 of debt upon the works; and they were making application for another £50,000. They were also saddled with the debt of the annual feu-duty on the ground. He thought it was time that this extravagant policy was stopped. After criticizing the recommendation of Mr. Foulis and Mr. Gillespie, Mr. Anderson said he did not see how they could be stupid enough in Perth to adopt a proposal such as this. Mr. Wotherspoon, in seconding, said it was a notorious fact that they had spent far too much on the gas-works. On a division, 11 voted for the amendment, and 10 for the motion. The Commissioners are already advertising for a Gas Manager. They are doing their best to prevent good men from applying, by thus quarrelling among themselves. Whoever may be appointed will require to school the Commissioners for a few years, if he wishes to lead a quiet life.

"The Notkin Syndicate, Limited"—What is it? It is a Company which was registered in Edinburgh, in February last, to acquire (as the Articles of Association say) letters patent for an invention for a method of, and apparatus for, automatically and continuously carburetting air for illuminating, heating, and other purposes. Put in another way, it is a Company to work the invention of M. Bouchaud-Praceig, which was exhibited in Edinburgh a month or two ago. The invention was fancied by some people, who, I understand, began to make inquiries about it. The story is they discovered that a Russian gentleman held protection for a somewhat similar invention, of prior date; and that, before anything could be done, it was necessary to come to terms with him. A deputation went to Russia to see him. My information is that somebody else was on the road, upon the same business; but that the Edinburgh men came in first. When they unfolded their proposal to acquire his interest, the Russian was not a little surprised. His invention had not been taken up—and, in fact, his protection had only three months to run. It looked as if it were to expire, and no result to come to him, when, lo! men from the far West came to him, and asked him to sell it. If it was worth their while to come so far, there must be something in it. Accordingly, a stiff price was put on; and the Edinburgh people paid it. Then they returned home, and formed the Company. The capital is £10,000 in £1 shares. Business is being pushed; and the promoters are confident of success. It is not claimed that the system is applicable to town lighting, but that it is a most suitable light for country houses. A practical test is being made, the results of which will be announced. This is all I can say about the matter at present; but I shall probably have something to add next week.

At a meeting of the Royal Scottish Society of Arts in Edinburgh, on Monday night, a paper by the venerable Mr. T. Whimster, late Gas Engineer at Perth, on "A Method of Deriving Continuous Power from the Rise and Fall of the Tide, for Mechanical Purposes," was read by one of his sons. Mr. Whimster himself was present to answer questions. His proposal is an ingenious device whereby, by means of dams, the inflowing and outflowing tide may be made to drive machinery. The paper is remitted to a Committee to consider the merits of it. We are not concerned with the merits; but we are glad that Mr. Whimster is still vigorous of mind, as he was of yore, and is able to occupy his well-earned leisure in matters which tend to the good of the community.

Sheriff Brand, of Ayr, has issued an interlocutor in a petition at the instance of the Police Commissioners of Troon, acting as Gas Commissioners under the Acts of 1876 and 1893, for permission to erect a gasholder and other works, to eventually cost about £15,000, and to dispense

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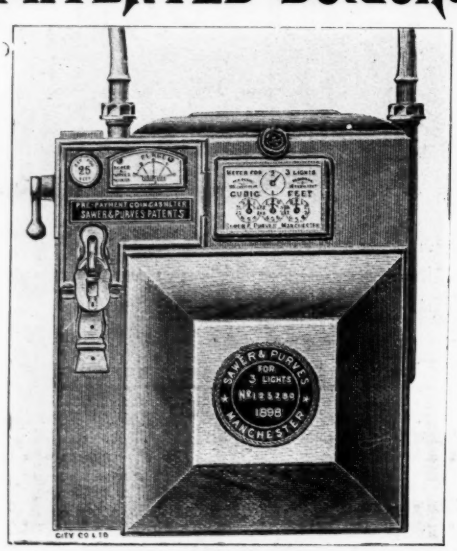

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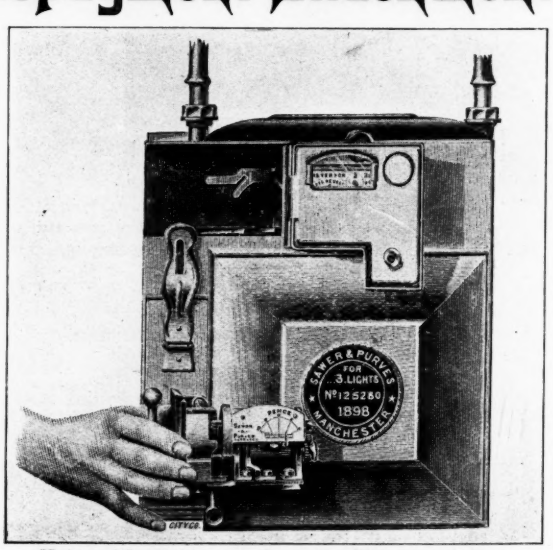

Meter with attachment removed without uncoupling

with the consents of owners and occupiers of dwelling-houses living within 300 yards of the proposed erections. Mr. W. M'Neill was an objector; and evidence led showed that the gasholder would, when erected, be within 20 feet of his cottage. The Sheriff, in his interlocutor, dispenses with the consent of Mr. M'Neill, holds him liable in expenses to the petitioners, and gives the necessary permission to proceed with the erection.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 28.

Sulphate of Ammonia.—The market remains quiet; and prices at the different points are still somewhat irregular. Values have, however, been fairly well maintained; the closing quotations being £11 6s. 3d. to £11 10s. per ton f.o.b. at the ports. There has been considerable inquiry for delivery over the summer months; but buyers' ideas are for the most part too low to admit of business. Makers are holding for a premium on spot prices, while buyers are endeavouring to get in at a discount.

Nitrate of Soda is weak on spot; the quotations being 8s. 4½d. per cwt. for ordinary, and 8s. 6d. for refined, quality.

LONDON, *April* 28.

Tar Products.—There is again more inquiry for carbolic acid, which, however, is scarce in makers' hands; most of them having taken advantage to sell forward when prices ruled much higher than they are to-day. To be in parity with crystals, crude carbolic should be several pence higher than to-day's quotations. Solvent naphtha is dull; and the demand for toluol has seriously fallen off. There is no business doing in heavy naphthas; and both creosote and tar oils are in a neglected state. Anthracene is dull; naphthalene is moving off freely in its various grades. There is a strong market for pitch; and contracts for next season at slightly above to-day's price are reported.

Quotations during the week have been: Tar, 17s. 6d. to 27s. 6d. Pitch, east coast, 37s. 6d.; west coast, 34s. Benzol, 90's, 5½d.; special qualities for gas, 7½d.; 50's, 9½d. Toluol, 90's, 1s. Solvent naphtha, 1s. Crude naphtha, 3½d. Heavy naphtha, 10d. Creosote, 2½d. Heavy oils, 3¼d. Carbolic acid, 50's, 2s. 2d.; 60's, 2s. 7d. Naphthalene, 50s. to 70s. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—Excepting that very little sulphate is offering, and that this is being taken up, there is no change of moment in this market. Dealers report business dull; but makers have none to sell—the nominal quotation being £11 7s. 6d. per ton, less 3½ per cent., at all ports.

The total income of the Basingstoke Corporation Water Department for the year ending March 31 last was £3199; and the gross profit £1926. After providing for interest and repayment of loans, the net profit was £989. It has been decided to reduce the water-rate from 1s. 2d. to 1s. in the pound.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With a continued scarcity of supplies in all descriptions of fuel, the tendency of prices necessarily is in a strong hardening direction; and during the past week there has been a further upward move. One very noticeable feature of the position is that, notwithstanding the advanced season of the year, all the leading collieries are still short of the better qualities of round coal; and not only is nothing going into stock, but coalowners have to purchase in outside districts to keep up deliveries of house-fire coal to their customers. This is a condition of trade that precludes all probability of prices easing down during the summer months. In fact, it is rumoured that some further advance is not impossible, owing to the fact that very large quantities of the better classes of round coal are being drawn away for manufacturing requirements; and the prospects for next winter are anything but satisfactory from the consumer's point of view. Collieries are absolutely denuded of stocks; and there would seem to be very little chance of these being replenished to any material extent. In the meantime, prices are exceedingly strong at the maximum quotations; and it would be difficult to buy any description of house coal under 14s. 6d. to 15s. 6d. per ton at the pit. The Lancashire collieries have now taken up a definite position with regard to the forthcoming locomotive fuel contracts, which will also govern pit prices upon all other contracts for steam and forge qualities of coal. It was stated some time back, in these reports, that an advance of 6s. per ton over the contract prices of last year for locomotive fuel was being talked of. This has now been definitely agreed to by the Lancashire Coal Sales Association; and the minimum basis for these contracts over the ensuing twelve months is to be 14s. per ton at the pit. Some small quantity has been bought at 1s. per ton below this figure; but any further contracts can only be settled at the rates fixed by the Association. This will also bring general contract prices for steam and forge coals up to about 14s. and 14s. 6d. per ton, in some instances. With regard to gas coal, the position is unchanged from what has been previously reported. One or two contracts have been put through during the past week; and on these collieries have had no difficulty in getting the full advance of 5s. per ton over last season's prices. So that this may be taken as the practically established basis for other contracts that have to come forward during the season. This will raise the basis price for gas coal to something like 13s. 6d. and 14s. to 14s. 6d. and 15s. per ton at the pit according to quality. On engine classes of fuel, there has also been a further upward move in prices; the Lancashire Coal Sales Association having decided that after the 1st of May the minimum price for slack is to be 10s. 6d. per ton at the pit, with better qualities quoted above this figure in proportion. For shipment, there is still only a limited amount of business; and here and there sellers have been taking prices under the Association basis of 16s. per ton for steam coal, delivered at the Mersey ports. This figure, however, remains the official list rate. For coke, the demand is quite as pressing as ever; and prices are very firm at the minimum of 24s. to 25s. for furnace, up to 30s. and 32s. for good foundry qualities,

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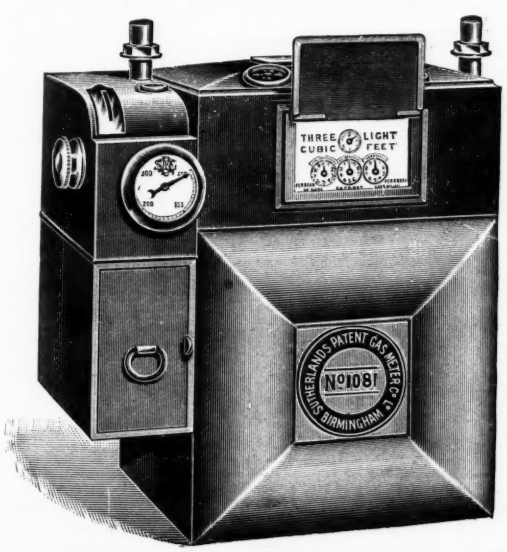

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at the ovens. Gas cokes have been further advanced by 1s. 10d. per ton, and are now quoted 18s. 6d. at the Manchester works.

Northern Coal Trade.—The coal trade is decidedly more active; and there are in some instances advances in prices. The Baltic trade usually influences the coal trade of the North-east very greatly; and this demand is now making itself felt. Best Northumbrian steam coals are 18s. 9d. to 19s. 6d. per ton f.o.b., and steam smalls are about 12s. and 12s. 6d.; the latter continuing scarce. There is little or no alteration in the price of manufacturing coals. In the gas coal trade, there is a good demand; and heavy shipments continue to be made, which are likely to be increased by the opening out of the Baltic trade. There have been some contracts entered into for the Metropolitan Gas Companies; but the prices and conditions are very irregular, and it is believed that a large portion of one contract has been given to a rival coalfield. For such contracts as have been allotted here, it is thought that the average price will be equal to about 16s. per ton f.o.b. In coke there is a good demand; and prices are very firm, both for home use and for export. In gas coke, there is a lessened production to deal with, and hence prices, if unchanged, are very firm at the last quotation we gave; about 16s. per ton f.o.b. being the medium figure. The Newcastle Gas Company have practically purchased the whole of the coal they need for the year beginning in July next, the price being about that above stated.

Scotch Coal Trade.—There is no change in the condition of trade. Outputs are moving off freely, and prices continue to be firm. The quotations are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 15s. 3d. to 16s. 6d., and splint 15s. to 15s. 3d. The shipments for the week amounted to 207,468 tons—a decrease of 3506 tons upon the preceding week, but an increase of 48,132 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,003,613 tons—an increase of 742,899 tons upon the same period of last year.

The Newcastle correspondent of "The Times," writing on Saturday, said: "It is reported that the South Metropolitan Gas Company, unable to buy Durham coals at less than 16s. to 16s. 6d. a ton, have ordered a considerable portion of their ensuing half-year's supply from Yorkshire, at about 15s."

The Newcastle correspondent of the "Colliery Guardian," writing last Thursday, said: "The contract for supplying the Crystal Palace District Gas Company with about 100,000 tons of gas coal, which has usually come to Tyneside, has been given to Midland firms. After much negotiation, the South Metropolitan Gas Company have secured acceptable tenders for a portion of their requirements from local collieries at prices which are said to range from 16s. to 16s. 6d. per ton f.o.b. Tyne. These contracts are for six months' delivery instead of twelve."

The County Council of Dublin have decided to take the necessary measures for prosecuting an appeal against the judgment of the Master of the Rolls in the action of the Alliance and Dublin Consumers' Gas Company in regard to the use of steam-rollers (*ante*, pp. 752, 815).

Liverpool Gas-Fittings Company, Limited.—The Directors, in submitting the statement of accounts for the year ended March 31 last, report that the net profit for the year is £516, which, with the £148 left after paying last year's dividend, makes £664 to the credit of profit and loss. The Directors recommend that a dividend be declared for the year at the rate of 5 per cent. (free of income-tax). This will leave £164 to be carried forward.

Bombay Gas Company, Limited.—In the report which the Directors of this Company will present at the ordinary general meeting on the 10th inst., they state that, compared with the year 1898, the revenue from the public lamps in 1899 exhibits an increase of £710 19s. 10d., and from private consumers of £3046 18s.; making, with residual products, a total increase of £4015 14s. 5d. The larger expenditure for coal carbonized is chiefly due to higher cost of material and freights. Loss by exchange, amounting to £15,088 19s. 2d., has been written off the revenue. Mr. F. W. Chamberlain has had the management of the Company's affairs in Bombay for the last eighteen months; and the Directors express their gratification at being able to report the satisfactory progress made during this period. After writing off £1158 18s. 6d. for the renewal of a gasholder, the balance of the general revenue, including the amount brought forward (£422 13s. 2d.), is £15,175 2s. 10d. Deducting the interim dividend paid in December last (£7200), and £375 added to the reserve fund, there remains £7600 2s. 10d. for distribution. The Directors recommend a dividend of 3 per cent. (making 6 per cent. for the year), carrying forward £400 2s. 10d.

Sheffield Gas Workers and the Union.—A local branch of the Gas Workers and General Labourers' Union has been formed at Sheffield, and is reported to be making vigorous progress—600 members having been enrolled previous to meetings held last Friday. The meetings had for their purpose the urging of the need of more efficient organization upon the gas-works employees. At one of the meetings, the Chairman of the new branch (Mr. James Hammond) presided; and he stated that since it was started seven weeks before, a large number of gas workers had enrolled themselves, although there were still a few who remained outside. Some time ago the workers at the three gas-stations approached the Directors with a request for an additional 6d. a shift on the wages of all employed in the carbonizing department. The Directors, however, met them in a very half-hearted way; granting an increase of 3d. to certain grades only, and regretting that they could not alter the wages of the rest of the men. The employees, however, thought that they were entitled to a general increase, and to secure their ends they must be united. Since the above concession, the general labourers had been advanced another 1s. a week for certain work, and had later been successful in obtaining a further increase. The enginemen, whose work was very responsible, had been unable to secure better wages, although, in his opinion, the Company could well afford to grant their request. The existence of the Union would give them a better chance of improving their position than they had before possessed. This looks as though, whatever other branches of labour may be doing, the Sheffield gas workers are not taking so kindly to the Union as the officials could wish.

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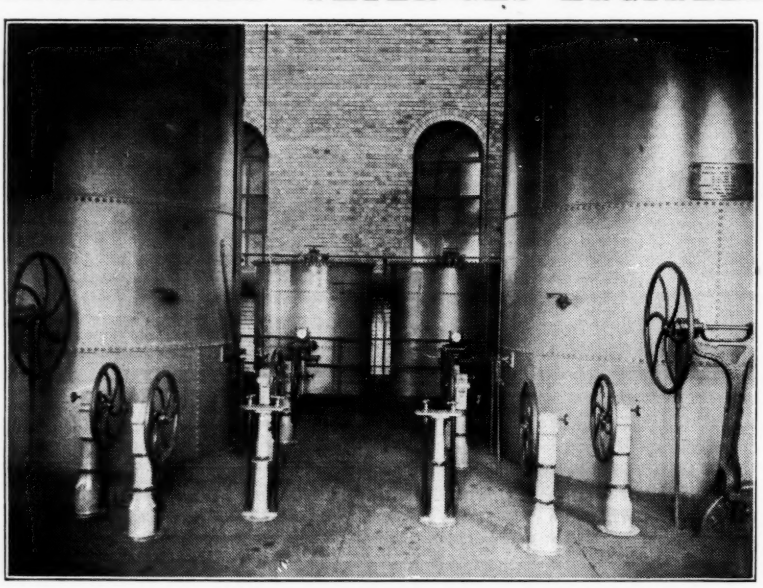

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The Accident at the North Walsham Water-Works.—The two men who were entombed in a well at the North Walsham Water-Works (as reported last week) were rescued after twenty-four hours' incarceration. It appears that they were working in connection with the water-works, 90 feet below the surface, when the sides of the well collapsed 20 feet from the top, the soil blocking the exit from a 7-foot cylinder in which the men were engaged. After tunnelling had been tried for several hours, the men were spoken to, and supplied with milk and eggs. When rescued they were taken to an hotel, where, with careful nursing, it was expected they would soon recover.

Heysham and the Morecambe Gas Bill.—The Heysham District Council are evidently believers in full, free, and thorough discussion. For nearly five hours last Thursday night, they sat, debating whether or not they should carry their opposition to the Morecambe Gas Bill to the House of Lords. No resolution could be arrived at; and the meeting was then adjourned until the following morning, when the Council again met and resumed the discussion. After seven hours' deliberation, they decided to carry their opposition to the Upper House. The chief objection is to the Morecambe Authorities applying the profits of the gas undertaking to the relief of Morecambe rates, and altogether excluding Heysham from any benefit. Has their attention been called to the Glastonbury case?

The Helston Gas Company and the Corporation.—Considerable discussion took place at a meeting of the Helston Town Council on Thursday with reference to the right of the Gas Company to open the streets for the purpose of laying or repairing their pipes. At a recent meeting, the Council decided that the Company should be required to give three days' notice before interfering with streets, unless it was a case of emergency. Mr. A. R. Thomas moved that this resolution be rescinded, and said that when the undertaking was started in 1833 a lease was granted by the Corporation for 100 years, giving the Company ample powers unconditionally to break up the streets. These powers were never questioned until 1893. Since then correspondence had taken place between the Council and the Company; and the former had recently taken Counsel's opinion on the subject, which was that the Corporation had no power to grant a lease. Counsel's opinion, however, was not always to be depended upon. The Gas and Water Companies had conferred great benefit on the town, and any difference could be settled without attacking the Companies' title. Mr. W. Harris seconded the motion rescinding the previous resolution. Mr. H. Toy suggested that a Committee should be appointed to confer with the Gas Company. The Mayor (Mr. A. Pengelly) said the resolution was passed because of a little friction with the Water Company with reference to opening the streets. The Council thought it best to serve both Companies alike. The streets had been opened at most inopportune times by the Gas Company. Mr. A. E. Radcliffe contended that the Company had no statutory power, as the undertaking was not incorporated by Act of Parliament. As to the lease granted by the Corporation seventy years since, it was not worth the parchment on which it was written. Eventually, a Committee of five was appointed to confer with the Gas Company, to see what terms they are willing to agree to, and to report to another meeting of the Council.

Gas-Works in the Market.—It will be seen by two announcements which appear elsewhere that Mr. Alfred Richards will offer for sale next Tuesday, at the Mart, Tokenhouse Yard, E.C., the Sawston Gas-Works, situated about equi-distant from the Whittlesford and Shelford stations on the main Cambridge line of the Great Eastern Railway. They are held for a term of about 70 years unexpired, at a nominal rent of £1 per annum. On the 23rd inst. he will bring under the hammer the Crawley Gas-Works (freehold).

The Deduction of Income-Tax from Dividends.—"A Secretary" has written as follows to the "Financial News," on the subject of the rate of income-tax to be deducted from dividends: "I have received from Somerset House a reply to my letter to the Chancellor of the Exchequer, and it is clear therefrom that I am correct in my intention to deduct 10d. in the pound from dividends payable out of profits earned in the half year ending June 30, 1900. It appears, however, that this arises from the fact that my Company is a British one, and that in the cases of foreign and colonial companies the tax is deductible at the rate which is current when the dividends are payable. Foreign and colonial companies are at the moment, therefore, at a disadvantage as compared with British companies; but when the tax is reduced, the foreign and colonial companies will receive immediate relief, whereas the British companies' relief will be deferred."

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold some ordinary stock of the Lea Bridge District Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale (last dividend on similar stock 6 per cent. per annum), at £120 per £100 of stock; yielding the purchaser 5 per cent. interest. At the Mitre Hotel, Chatham, on the same day, Mr. Franklin Homan offered for sale a few fully-paid £5 shares in the Chatham, &c., Water-Works Company, which were disposed of at £14 12s. 6d. each. On the same occasion, a £50 "A" share in the Rochester Gas Company fetched £126 10s.; and two similar shares, £127 each. Six fully-paid £12 10s. "B" shares in the same Company realized £22 10s. apiece; fully-paid £3 6s. 8d. "C" shares, £6 5s. and £6 7s. 6d. each; and fully-paid £8 10s. "D" shares, £22 and £22 2s. 6d. each. The following day, at Gravesend, Messrs. Glover and Homewood disposed of several original shares in the Gravesend and Milton Gas Company, by order of Trustees, at £45 each; some new issue shares in the same Company fetching £34 apiece. At the Castle Hotel, Windsor, the same day, Messrs. Buckland and Sons sold a number of shares in the Windsor Royal Gas Company. Original (£25) shares realized £41 10s. and £41 15s. each; preference shares of £8 each, fully paid, made £11; and new shares of £20 each, fully paid, fetched £30 apiece, while some on which £8 has been called up sold for £11 each. On Thursday, Messrs. Alexander, Daniel, and Co. offered for sale by auction £15,000 of the Bristol Water Company's 7 per cent. maximum consolidated ordinary stock, in lots of £100, at the reserved price of £158 each. The highest price realized was £162; and the lowest, £160—the average being £161 0s. 0·8d. The total amount of the sale reached £24,150. Messrs. Crashe sold at Colchester last Friday some "A" and "B" shares, of £20 each, in the Colchester Gas Company, which realized prices ranging from £35 to £49 15s. per share.

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Additional Capital for the South Staffordshire Water Company.—At an extraordinary general meeting of this Company held last Thursday, the Directors were authorized to raise, by ordinary, preference, or debenture stock, the £50,000 remaining uncalled up of the £150,000 sanctioned by the Company's Act of 1893; large expenditure having lately been incurred in making provision for the extraordinary demand for water in the district.

Accident to a Large Water Main.—Last Wednesday night an extraordinary burst occurred on the Liverpool water-main at Colebrook, near Northwich. A cast-iron pipe, weighing three tons, burst to the extent of 10 feet by 2 feet. The tremendous rush of water opened a hole 15 feet deep and 14 yards long, and washed a portion of a bye-road away. Northwich water-gauge house was flooded; but no serious damage was done. Had the usual quantity of water been passing, 45 million gallons would have been lost.

Cardiff Water-Works Finances.—At a recent meeting of the Cardiff Water Committee, it was stated that the actual expenditure for the half year ending March, 1900, in connection with the Water Department was £8921, which showed a surplus of £165 on the estimated expense. This was exclusive of the loan charges during the same period, which amounted to £28,178 for principal and interest. It was reported that the Penylau reservoir and water-tower had been rated at £740; while the Corporation Engineer (Mr. C. H. Priestley) put the value at £419.

The Projected Transfer of the Spalding Water-Works.—A special meeting of the Spalding Water Company was held last Thursday, to consider the provisional contract made by the Directors for the sale of the undertaking to the Spalding District Council. There was no opposition; and the proposed transfer was approved. According to the terms arranged, the shareholders will obtain a considerable premium for their shares. The Council are promoting a Bill for the purchase of the works; and the measure is unopposed. The agreed price is £24,000.

Tipton Gas Profits and the Rates.—The Finance Committee of the Tipton District Council recently decided to recommend the levying of a general district rate of 2s. 9d. in the pound. They had, however, only reckoned upon receiving £250 from the profits of the gas undertaking as in previous years; but at a meeting of the Gas Committee yesterday week, it was found they would be able to hand over £800 from the profits. This enabled the Finance Committee last Tuesday to recommend that the rate be 2s. 7d. in the pound, the same as last year.

Water Charges at Bradford.—The Water Sub-Committee of the Bradford Corporation have been considering the question of dealing with the charges for water to large consumers; and as a result an important recommendation is to be made to the City Council. At the present time, the price of water to consumers up to 400,000 gallons is 9d. per 1000 gallons; and after the consumption of 400,000 gallons, the price has been 6½d. per 1000 gallons. The Committee have decided to raise the price of water used over 400,000 gallons to 8d. per 1000 gallons. The net cost price of water is 8¼d. per 1000 gallons.

Manchester Corporation Water Supply.—The annual report of the Manchester Corporation Water Committee states that the consumption of water still continues to increase. The annual increase in consumption from 1895 (when the supply from Thirlmere was brought into use) to 1899, a period of four years, has been on the average at the rate of about a million gallons per day. The average daily consumption for the past year has been 32½ million gallons, as compared with a consumption of 21 million gallons ten years ago, and above 2 million gallons in excess of that in 1898. About 25 million gallons of this has been supplied from Longdendale, and the remainder from Thirlmere. A considerable proportion of this increase in consumption is to be attributed to the general adoption of the water-closet system in the city and district. Having regard to this increased demand for water, the Committee are of opinion that the time is fast arriving when they will have to take action in regard to laying an additional pipe in connection with the supply from Thirlmere.

Messrs. Biggs, Wall, and Co. have received orders for the erection of their "Rapid" manual retort-charging machines from the Ilfracombe and Monte Video Gas Companies.

The Halifax Corporation have placed with Messrs. R. Dempster and Sons, Limited, of Elland, a repeat order for coal-hoppers, hydraulic and foul mains, &c., in connection with inclined retorts.

Messrs. A. C. Wells and Co. have just shipped out to St. Helena, for the Government, thirty Wells lights, which are to be used for the purpose of lighting the enclosures in which the Boer prisoners are quartered.

Messrs. Graham, Morton, and Co., Limited, are showing in the Gas Section of the Paris Exhibition, at the stand of M. Derval et Cie., furnace builders, of Paris, a large working model of a complete installation of inclined retorts.

The Leeds Corporation Gas Committee have decided to accept the tender of Messrs. Graham, Morton, and Co., Limited, for the provision of automatic coke conveying and storing plant at the Meadow Lane Gas-Works. The contract price is £5340.

Messrs. James Milne and Son, Limited, have secured the following contracts for square station meters: One of 80,000 cubic feet per hour capacity for the Coatbridge Gas Company, one of 50,000 ditto for Yeadon and Guiseley, and one of 25,000 ditto for Beverley.

At the Mart, Tokenhouse Yard, to-morrow, Mr. Alfred Richards will offer for sale, by order of the Directors, 2500 fully-paid £10 ordinary shares in the West Ham Gas Company. They will rank for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; the last dividend on similar shares in the Company having been at this rate.

Last Tuesday, the Directors of the Chard Gas Company, with the Manager and Secretary (Mr. F. Turner), inspected the extensive works of Messrs. Willey and Co., of Exeter. Several of the principal citizens, including the Town Clerk (Mr. G. R. Shorts), were invited to meet them; and at the close of the visit the party were entertained at dinner by Mr. H. A. Willey, at the New London Hotel.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.

ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.

MELROSE CYCLE COMPANY, COVENTRY.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER AND CO., MIDDLESBROUGH.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.

Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, See p. 1157.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application
No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

A Young Man (aged 25) seeks Engagement as GAS-FITTER, and MAIN and SERVICE LAYER. Has had experience in Reading and Fixing Meters, Cookers, Gas-Fires, and Internal and Automatic Work.

Address Mr. G. PEACOCK, Talbot Villa, Llanface, Brecon, SOUTH WALES.

WANTED, by a Married Man (aged 30), a Situation as MANAGER of Small Works or SERVICE LAYER. Can read and fix Meters.
Address H. BARNES, The Cottage, care of Mr. BENSON, Middleton-one-Row, DURHAM.

WANTED, a Situation by a smart, active Man (aged 37), Abstainer and Non-smoker, and just from the Colonies. Capable of taking charge of Small Gas Plant, acting as general help to Manager, or occupying position as Store-keeper in Large Gas or Engineering Works. Used to Fitting, Meter Fixing, Service Laying, Drilling, Tapping, and Screwing, Index Reading, Collecting, &c. Thirteen Years' Character.
Address No. 3480, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a few good Retort Setters at once.
Address the LEEDS FIRE-CLAY COMPANY, Engineering Department, Wortley, near LEEDS.

WANTED, at once, a Single Man as STOKER. Willing to make himself useful. Permanency to a suitable Man. Wages 28s. for Seven Days, with a week's holiday in summer.
A. E. BUCKLEY, Gas-Works, CORBRIDGE.

WANTED, in a Tar-Works within 100 miles of London, a Young Man as UNDER STILLMAN.
Address, stating Experience and Wages required, to No. 3484, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, in a Midland Town for four or five Months, a thoroughly experienced GAS-METER TESTER.
Apply, by letter, with Testimonials, and stating Wages required, to No. 3483, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Small Gas-Works, a GAS MAKER, who can do light Repairs, Service Laying, Meter Taking or Fixing.
Wages 25s. per week, with House, Coal, and Gas free.
Applications, with *copies* of recent Testimonials, to be sent to No. 3486, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, one or two additional REPRESENTATIVES calling on Gas Companies in Districts where Eveson's (Coal and Cannel) are not represented. Must have had good experience, and be well known to Gas Managers.
Replies, marked "Private," to be addressed to the EVESON COAL AND COKE COMPANY, LIMITED, BIRMINGHAM.

WANTED, at the Gas-Works, Shifnal, Salop, a WORKING MANAGER to take charge of the Works and Manufacture of Gas. Wages 28s. per week, with good House, Coal, and Gas.
For Particulars apply to the Clerks to the Company; but formal application to be sealed and delivered at our Offices not later than the 9th of May next.
FARMER AND FARMER,
Clerks to the Company.

WANTED, by a Firm manufacturing Ordinary and Prepayment Meters, Gas Fittings, &c., of the highest repute, a TRAVELLER for the Northern Counties, where they are at present unrepresented. To a Man with good connection and ability, an exceptionally good opening is offered.
State Age, Particulars of last Engagement, &c., to No. 3485, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MAIN AND SERVICE LAYER.

WANTED, by the Altrincham Gas Com- pany, an experienced MAIN and SERVICE LAYER. Wages 30s. per week.
Apply, stating Age and previous Engagements, to the undersigned.
J. E. LAMB,
Manager.
Gas Offices, Altrincham,
April 28, 1900.

PERTH GAS-WORKS.

APPLICATIONS are invited for the Office of GAS MANAGER.
Applicants to have a thorough knowledge of Gas Management and Manufacture in all Departments, and to be able to prepare Specifications and Drawings and Estimates of Cost of Gas-Making Plant, &c.
Salary £300.
A Print containing Statement of Duties, and Terms and Conditions of Appointment, and also Forms of Application, may be had by applying to JOHN BEGG, Clerk to the Perth Gas Commissioners, with whom applications are to be lodged on or before the 10th of May next.
Canvassing is prohibited.
Perth, April 24, 1900.

DERBY GASLIGHT AND COKE COMPANY.

WANTED by the Directors of this Com- pany an experienced and competent ENGINEER AND MANAGER to take entire charge of their Works (make about 550 million cubic feet). He must have a practical knowledge of the Manufacture of Coal and Water Gas and Sulphate of Ammonia upon the best modern systems. The person appointed to devote the whole of his time to the duties, and be able to design and carry out Alterations and Extensions of Plant.
Applications to be by letter, marked "Engineer," stating Age, Salary required, Training and Experience, accompanied by *copies* of three Testimonials of recent date, addressed to the CHAIRMAN, at the Company's Office, Friar Gate, DERBY, on or before May 8, 1900.

WANTED, a Smart Young Man as CLERK at Gas-Works, Ash Road, Aldershot.
Apply, stating Wages required, to the SECRETARY, Gas Office, Victoria Road, ALDERSHOT.

BOROUGH OF IPSWICH.

WANTED, a thoroughly practical PLUMBER to act as WATER-FITTINGS INSPECTOR in the Water-Works Department of the Ipswich Corporation.
Applicants will be required to hold a Registered Certificate (by examination) from the Worshipful Company of Plumbers, London.
Wages commencing at 35s. per week, with Uniform.
Applications, stating Age and Experience, with *copies* of not more than three recent Testimonials (which will not be returned), to be sent to the undersigned on or before the 12th of May, 1900, and endorsed "Water-Fittings Inspector."
HAMLET ROBERTS,
Engineer and Manager.

MIDLAND RAILWAY.

TO GAS ENGINEERS.

THE Directors of the above Company are prepared to receive APPLICATIONS from experienced and competent persons to take charge of the Gas Department of the above Railway, under the supervision of the Locomotive Superintendent.
Salary £350 per annum.
Applications, by letter, with Testimonials enclosed, endorsed "Application for Gas Engineer," to be addressed to the Secretary of the Locomotive Committee, Midland Railway, Derby, to be received by him not later than nine a.m. on Thursday, May 17, 1900.
ALEXIS L. CHARLES,
Secretary.
Derby, April 27, 1900.

SHARES wanted in C. & W. Walker, Limited, either Preference or Ordinary.
State Number for disposal, and Price required, to No. 3468, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a second-hand Washer, capable of dealing with at least 150,000 cubic feet per day.
State Price, with or without Valves, to the MANAGER, Gas-Works, FORMBY.

GAS Tar for Sale.
Apply to the SECRETARY of the Gas Company, TENTERDEN.

EXHAUSTER for Sale, 5000 feet, George Waller and Co., in good condition. Replaced by larger one.
C. W. GRIMWOOD, Sudbury, SUFFOLK.

CONDENSER (Morris & Cutler's), 21 ft. 6 in. by 6 ft. 6 in. by 3 ft. 6 in., 1 million per day. Equal to new. Exceptional Bargain, if sold promptly.
Address No. 3463, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Two Lancashire Boilers, each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.
Apply to NEWTON, CHAMBERS, & Co., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

FOR SALE—Four 6 feet square Purifiers, together with 6-inch Centre-Valve and Connections. To be taken out on account of being replaced by larger ones.
The Boxes and Valves are in good condition, and can be seen working at present on application to W. C. HOLMES AND CO., HUDDERSFIELD.

EXHAUSTERS, 1500 to 60,000 feet per hour, with or without Engines.
LIVESEY WASHERS, CUTLER CONDENSER, SCRUBBERS, 5 feet and 6 feet diameter, METERS, GOVERNORS, PURIFIERS (Sets of 6 feet and 10 feet square), BOILER and other TANKS, VALVES, &c.,
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

FOR SALE—A Washer by Cockey. Size 10 ft. by 4 ft. 9 in. by 3 ft. 9 in., in four Compartments, with Manholes, Water-Supply Pipes, and 6-inch Gas-Connections. All in good condition. Suitable for a Gas-Works making 12 millions a Year and under.
For Particulars, apply to the MANAGER, Gas-Works, Whittington, near CHESTERFIELD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

LONGWOOD GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (5° Twaddel), produced during the Twelve Months commencing July 1 next.
Tenders, endorsed "Tar and Liquor," to be sent in on or before Wednesday, May 9, addressed to the undersigned, from whom any further Particulars may be obtained.
JOHN HENRY BREARLEY,
Engineer and Secretary.

SEVENOAKS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Sevenoaks Gas Company invite TENDERS for the supply of 7000 to 8000 Tons of GAS COAL (Durham or Yorkshire preferred), during Twelve Months ending May 31, 1901, delivered at the Company's Siding, Bat and Ball Station, S.E. & C.R., Sevenoaks, Kent.
Tenders to be sent in by not later than Tuesday, May 8, 1900, addressed to the Chairman, William Hughes, Esq., 88, High Street, Sevenoaks.
Further Particulars, if required, may be obtained of the undersigned.
HENRY HOW,
Secretary.
Gas Office, Sevenoaks,
April 27, 1900.

MILLOM URBAN DISTRICT COUNCIL.

TO GAS-WORKS ENGINEERS AND CONTRACTORS.

THE Council invite Tenders for the Materials and Labour in providing WROUGHT-IRON FRAMING for supporting Tar-Tanks, also ROOF over the same, CORRUGATED IRON SHEETING for sides, WOOD BEAMS for Railway Metals and the RAILS for same at the Millom Gas-Works; also the supply and fixing of about 60 yards of 10-inch and 8-inch PIPES and CONNECTIONS.
Plans and Specifications may be seen at my Office.
Sealed Tenders, endorsed "Tar-Tanks Shed," must be sent to me by the 15th of May next.
The Council will not be bound to accept the lowest or any Tender.
W. T. LAWRENCE,
Clerk to the Council.
Millom, Cumberland,
April 24, 1900.

MILLOM URBAN DISTRICT COUNCIL.

TO GAS-WORKS ENGINEERS AND CONTRACTORS.

THE Council invite Tenders for the Materials and Labour in providing an ADDITIONAL LIFT by telescoping existing Single-Lift Gasholder, 60 feet diameter by 16 ft. 2 in. deep, with Cup, at the Millom Gas-Works.
Plans and Specifications can be seen at my Office.
Sealed Tenders, endorsed "Gasholder," must be sent to me by the 15th of May next.
The Council will not be bound to accept the lowest or any Tender.
W. T. LAWRENCE,
Clerk to the Council.
Millom, Cumberland,
April 24, 1900.

CORPORATION OF WALSALL.

TENDERS FOR GAS COAL.

THE Corporation of Walsall invite TENDERS for the supply of 50,000 Tons of STAVELEY, YORKSHIRE, or any other good GAS COAL, and 5000 Tons of screened GAS NUTS, to be delivered during One Year from the 1st of July next, at the Corporation Siding at the Pleck Gas-Works, Walsall, as may be required.
Forms of Tender and Specification may be obtained on application to the undersigned.
The Corporation do not bind themselves to accept any Tender; and they reserve the right to divide the Contract between several firms.
Tenders, sealed and marked outside "Tender for Gas Coal," and stating the price for large Coal and also for Nuts, are to be sent to the undersigned on or before Saturday, the 26th of May inst.
JOHN R. COOPER,
Town Clerk.
Borough Offices, Walsall,
April 28, 1900.

TO LIME MASTERS.

THE Corporation of Walsall invite TENDERS for the supply of about 850 Tons of LIME, which will be required at their Gas-Works during One Year from the 1st of July next; the deliveries to be in such monthly quantities as the Manager of the Gas-Works may from time to time direct.
The Lime is to be Hand-picked, and clear from Refuse and Ashes, and to be delivered at the Corporation Siding at the Pleck Gas-Works as required.
Payments monthly.
Tenders, sealed and marked outside "Tender for Lime," are to be sent to the undersigned on or before Saturday, the 26th of May inst.
JOHN R. COOPER,
Town Clerk.
Borough Offices, Walsall,
April 28, 1900.

WALLASEY URBAN DISTRICT COUNCIL.

TO COAL MERCHANTS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply of about 23,000 Tons of GAS COAL and CANNEL for their Gas-Works, delivered in Waggons at Duke Street Siding, Birkenhead, separately, for One, Two, or Three Years, from the 30th of June next.
Specifications and any further Information may be obtained on application to the Engineer, at the said Works, Great Float, near Birkenhead.
Sealed Tenders, addressed to the undersigned, and endorsed "Gas, &c., Committee—Tender for Coal and Cannel," to be sent per post not later than Wednesday, the 16th day of May, 1900.
The Contractor will be required to enter into a bond, with approved sureties, for the due completion of the Contract.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
H. W. COOK,
Clerk to the Council.
Public Offices, Egremont, Cheshire,
April 28, 1900.

HERTFORD GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 2000 Tons of unscreened SILKSTONE GAS COAL, delivered at the G.N.R. Gas-Works Siding, Hertford; and about 1500 Tons of SEABORNE COAL, delivered alongside Gas-Works Wharf.

Delivery to be as required over the Year ending the 30th of April, 1901.

The Directors reserve the right of dividing the Contract.

Tenders, endorsed "Coal," to be sent in before the 8th of May next.

ROB. WATSON,
Manager and Secretary.

Gas-Works, Hertford,
April 25, 1900.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gaslight Company, invite TENDERS for the supply of about 15,500 Tons of screened GAS COALS, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1900, and ending June 30, 1901.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 24th day of May, 1900.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
April 28, 1900.

THE Llandudno Urban District Council invite TENDERS for the supply of 7000 Tons of best screened GAS COAL, capable of producing a minimum of 10,000 cubic feet of 18-Candle Gas per Ton, to be delivered, Carriage Paid, between the 1st of July next and the 30th of June, 1901, at the Llandudno Station of the London and North-Western Railway, in such quantities and at such periods as may be ordered from time to time.

Forms of Tender may be obtained on application to the undersigned; and only such Tenders as are upon the prescribed Form will be considered.

In every case where the Particulars asked for are not given, the Tender will be thrown out and not considered.

Tenders must be sent to the undersigned not later than the 11th day of May next.

The Tender of any Person or Firm who personally or through an Agent canvasses any of the Officers or Members of the Council will be rejected.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) ALFRED CONOLLY,
Clerk to the Council.

April 26, 1900.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THE Members of the Board invite TENDERS for about 600 Tons of OIL suitable for the Manufacture of Carburetted Water Gas.

The Oil to have a Flashing-Point of not less than 73° (Abel's Test).

A full description of the Oil, with a Sample, must be sent with the Tender.

The Oil must be delivered free into the Storage-Tanks of the Board at the Gas-Works, Accrington, in such quantities and at such times as the Board or the General Manager may require.

Tenders must be at a Price per Imperial Gallon.

Sealed Tenders and Samples must be addressed to the Chairman, the Accrington District Gas and Water Board, St. James' Street, Accrington.

Tenders must be in my hands on or before Wednesday, the 9th of May next.

The Members of the Board do not bind themselves to accept the lowest or any Tender.

By order of the Board,
CHAS. HARRISON,
General Manager.

General Offices, Accrington,
April 19, 1900.

COUNTY BOROUGH OF WIGAN.

TENDERS FOR STORES.

THE Gas Committee invite Tenders as follows:—

CONTRACT No. 1—CAST MAINS and CONNECTIONS.
" " 2—WROUGHT-IRON TUBES and FITTINGS.
" " 3—BRASS TUBES and FITTINGS.
" " 4—LEAD PIPE.
" " 5—BLOCK TIN.
" " 6—CHARGING & FIRING SHOVELS.
" " 7—BROOMS.
" " 8—WOOD TROUGHING & COVERING
" " 9—GALVANIZED STOVE-PIPE and CONNECTIONS.
" " 10—BAR-IRON.
" " 11—STREET-LAMPS.
" " 12—GALVANIZED IRON BUCKETS.

The Contracts will be for One Year, commencing on the 1st of April, 1900, and ending on the 31st of March, 1901.

Forms of Tender to be obtained from the undersigned.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders, sealed, and endorsed with the name of the article tendered for (a sample of which must be forwarded, addressed to the Gas Engineer), to be addressed and delivered to J. J. Charnock, Esq., Town Clerk, Town Hall, on or before Monday, the 14th of May next.

J. TIMMINS,
Engineer.

Borough Gas-Works, Wigan,
April 26, 1900.

TENDERS FOR COAL.

THE Directors of the Oxford Gaslight and Coke Company invite TENDERS for the supply of about 33,000 Tons of screened GAS COAL and NUTS, to be delivered in Trucks at the Gas Company's Siding (G.W. Railway), before June 30, 1901.

Tenders, stating description of Coal, to be sent by post, endorsed and addressed to the undersigned, not later than May 14, 1900.

JAMES ELDRIDGE,
Engineer and Manager.

BOROUGH OF DONCASTER.

TENDERS FOR COAL.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the supply of 24,000 Tons of best screened GAS COAL, during a period commencing July 1, 1900, and terminating June 30, 1901.

Particulars and Tender Forms may be obtained on application to the Chairman, or to the undersigned.

Tenders should be sent, under seal, to the Chairman, endorsed "Tender for Coal," not later than Ten a.m. on Thursday, May 10 next.

By order of the Gas Committee, who do not bind themselves to accept the lowest or any Tender.

R. BRIDGE,
Engineer.

Gas-Works, Doncaster,
April 25, 1900.

ILFORD GAS COMPANY.

TENDERS FOR COALS.

THE Directors of this Company are prepared to receive TENDERS for the supply of 7500 Tons of GAS COAL, at their Works during the ensuing Year, commencing the 1st of July, 1900.

Delivery to be made in Barges alongside the Company's Wharf at the Works, or f.o.r. Ilford Station, G.E.R., in specified monthly quantities.

The firm whose Tender is accepted will be required to enter into an agreement, under monthly penalties of £20 each, for the due performance of the contract.

The Company do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, giving Analysis and full Description of Coal, to be delivered to the Secretary not later than May 14, from whom Forms of Tender and any further Particulars may be obtained.

Gas-Works, Ilford,
April 28, 1900.

TO COLLIERY PROPRIETORS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL, for delivery during Twelve Months to the 30th of June, 1901.

The quantities required will be approximately—

100,000 Tons of Gas Coal (Tenders to state whether Screened or Unscreened).
100,000 Tons of Nuts.
60,000 Tons of Cannel.

Tenders (Forms for which can be obtained on application) must be delivered to the undersigned, by post, not later than the first post on Friday, May 11.

The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
April 27, 1900.

COWES URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee of the above are prepared to receive TENDERS for the supply of the whole or part of 4000 Tons of best screened GAS COAL, to be delivered f.o.b. in quantities as may be required during the Year ending May 31, 1901. Four days allowed for loading at port of shipment.

Tenderers may at their option give an alternative price including delivery in Sailing Ships, not exceeding 18 ft. 6 in. extreme draft, at the Gas Department's Wharf at Cowes, or in Sailing Ships or Steam Ships at the Railway Company's Wharf at Cowes.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Any further Particulars may be obtained of the undersigned.

Sealed Tenders, endorsed "Tender for Coal," to be delivered at the Offices of the Department not later than the 14th day of May next.

By order,
WILLIAM HALLIDAY,
Secretary.

Gas Offices, 40, High Street,
Cowes, April 25, 1900.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to receive sealed TENDERS for the supply of GAS COAL, including carriage to the Bridgnorth Railway Station, for One Year from or soon after the end of June next.

Evidence as to quality of Coal must accompany each Tender.

Quantity required: About 2500 Tons per annum in proportionate deliveries as directed—say 70 per cent. during Winter Months, and 30 per cent. during Summer Months.

Sealed and marked Tenders must be sent to the undersigned not later than Monday, the 14th of May.

The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Official Forms of Tender are not furnished.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth, April 28, 1900.

RAMSBOTTOM GAS COMPANY.

TENDERS FOR COAL.

THE Directors of this Company invite TENDERS for the supply of 6000 Tons of GAS COAL, to be delivered at their Siding, Stubbins, near Ramsbottom, as may be required during the Year ending June 30, 1901.

Further Particulars and Form of Tender on application to the undersigned.

Tenders to be sent to John Rothwell, Esq., Chairman, Gas-Works, Ramsbottom, and endorsed "Tender for Coal," not later than Saturday, May 5.

FRANK BARRETT,
Manager and Secretary.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Leek Urban District Council invite TENDERS for the supply of Best Screened GAS COAL, Washed NUTS, and CANNEL for One Year from the 1st of July, 1900, to be delivered at the Leek Station on the North Staffordshire Railway at such times and in such quantities as may be required.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, not later than Saturday, the 12th of May, 1900.

By order,
C. HENSHAW,
Clerk of the Council.

Town Hall, Leek,
April 28, 1900.

BOROUGH OF BARROW-IN-FURNESS.

TENDERS FOR COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS for the supply of screened GAS COAL AND CANNEL during the Year ending the 30th of June, 1901.

Form of Tender and further Particulars may be obtained from the Manager of the Gas-Works.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Wednesday, the 23rd day of May, 1900.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
April 26, 1900.

SKIPTON URBAN DISTRICT COUNCIL.

TO COLLIERY PROPRIETORS, COAL MERCHANTS, AND OTHERS.

THE Council invite Tenders for the supply of about 8500 Tons of Best Screened GAS COAL, to be delivered free at the Railway Station at Skipton, or at the Council's Siding adjoining the Gas-Works on the Leeds and Liverpool Canal, between July 1, 1900, and July 1, 1901, in monthly quantities.

No Form of Tender issued.

Further Particulars as to periods and quantities of Deliveries, &c., may be obtained from the Manager, Mr. J. H. Woodward. Gas-Works, Skipton; and Tenders, endorsed "Tender for Gas Coal," are to be sent to him on or before Saturday, May 12, 1900.

The lowest or any Tender not necessarily accepted.

RICHARD WILSON,
Clerk to the Council.

April 27, 1900.

BOROUGH OF BRIGHOUSE.

TENDERS FOR GAS COAL, CANNEL, AND LIME.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of GAS COAL and CANNEL and BUXTON LIME required at the Mill Lane and Birds Royd Gas-Works during the Year ending the 30th of June, 1901.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane, Brighouse.

Sealed Tenders, stating Price per ton delivered at the Gas-Works, or alongside Gas-Works by the Calder and Hebble Canal, or at Brighouse Railway Station, must be sent in on or before Friday, May 4, 1900, addressed to the Town Clerk, Public Offices, Brighouse, and endorsed on the outside "Tender for Coal" or "Lime," as the case may be.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Town Clerk's Office, Brighouse,
April 24, 1900.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 80,000 Tons of best well screened large GAS COALS, to be delivered between the 1st of July, 1900, and the 30th of June, 1901, in monthly quantities in accordance with the Specification.

Parties tendering may do so for the whole quantity, or for quantities from 5000 Tons upwards.

Forms of Tender and Specification of monthly deliveries may be obtained on application to the Engineer and Manager, Mr. H. Morley, M.Inst.C.E.

Sealed Tenders to be sent to the undersigned not later than Ten a.m. on Thursday, the 7th day of May next, addressed to the Chairman of the Company, and endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff,
April 21, 1900.

SHIPLEY GASLIGHT COMPANY.

TENDERS are invited for the supply of the whole or part of 18,000 Tons of best screened GAS COAL or NUTS, to be delivered free at Shipley Station (Mid. or G.N.) or into the Company's Coal-Stores per Leeds and Liverpool Canal during the Twelve Months ending June 30, 1901.

Tenders to be sent to the undersigned not later than Saturday, May 5, 1900, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any Tender.

T. G. WILCOCK,
Secretary and Manager.

Gas-Works, Shipley.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the supply of about 146,000 Tons of COAL and CANNEL required by them during the Year ending the 31st of May, 1901.

Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, the 8th of May.

A. NICHOLSON,
Town Clerk.

Oldham,
April 12, 1900.

SELBY URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council are prepared to receive TENDERS for about 4000 Tons of best screened GAS COAL or NUTS, delivered at their Gas-Works Siding, commencing June 1 next, in such quantities as may be from time to time required by the Gas-Works Manager.

Particulars and Forms of Tender may be had on application (in writing only) from the undersigned, to whom Tenders, endorsed "Tender for Coal," must be delivered on or before the 7th day of May.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
T. H. ALDERSON,
Engineer and Manager.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1200 to 1700 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Station, at such times and in such quantities as may be required prior to the 31st of May, 1901.

Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed Tenders, on the form provided for the purpose (with Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal." to be sent to the undersigned, on or before the 11th of May.

The Corporation do not bind themselves to accept the lowest or any Tender.

S. JOHN TOMBS,
Town Clerk.

Droitwich, April 12, 1900.

PETERBOROUGH GAS COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for 4000 Tons of best screened GAS COAL or COBBLES, to be delivered in equal weekly quantities to Aug. 31, 1900.

Tenders, endorsed "Coal," and addressed to the Chairman of the Company, to be delivered not later than Twelve o'clock at noon, on Tuesday, the 8th day of May, 1900.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the power to accept a portion of a Tender.

JOHN BARTON,
Secretary and Manager.

Gas-Works, Peterborough,
April 20, 1900.

CORPORATION OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before Monday, the 14th of May next, OFFERS of high class CANNELS and COALS suitable for Gas Making, for delivery at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three Years, commencing the 1st of August, 1900.

Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.

By order of the Gas Committee.
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
April 27, 1900.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply, during the Twelve Months from the 1st day of July, 1900, to the 30th day of June, 1901, of 11,500 Tons (more or less), of GAS COAL (screened or unscreened), to be delivered at the Bushey Station of the London and North-Western Railway.

Forms of Tender and Information may be obtained on application (in writing only) of me the undersigned.

Tenders to be delivered on or before the 7th day of May, 1900, addressed to the Chairman of the Watford Gas and Coke Company, Watford, and endorsed "Tenders for Gas Coal."

Tenders must be on the form supplied, any alteration of which will invalidate the Tender.

The Directors do not bind themselves to accept any Tender.

J. DUNCAN ROYAL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, April 13, 1900.

LONG EATON GAS COMPANY, LIMITED.

TENDERS are invited for the supply of the whole or part of One Year's requirement of best screened GAS COAL, to be delivered free at the Company's Sidings, Long Eaton (Midland Railway).

Tenders, endorsed, to be in by the 4th prox.

The Directors do not bind themselves to accept any Tender.

Form of Tender and further Particulars may be had from Mr. G. STEVENSON, Gas-Works, LONG EATON.

TENDERS FOR COAL.

THE Directors of the Maidstone Gas Company invite TENDERS for the supply of 28,500 Tons of unscreened DURHAM GAS COAL for the Year ending June 30, 1901.

Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.

Tenders sealed, and endorsed "Tender for Gas Coal," to be sent in not later than Wednesday, the 2nd day of May, 1900, addressed to the Chairman of the Gas Company, Maidstone.

The Directors do not bind themselves to accept the lowest or any Tender.

HENRY SMYTHE,
General Manager.

HARROGATE GAS COMPANY.

SALE BY TENDER OF £10,000 FOUR PER CENT. PREFERENCE STOCK.

THE Directors of this Company are prepared to receive TENDERS for the Whole or any portion, not being less than £10 or a multiple thereof, of the above-named £10,000 FOUR PER CENT. PREFERENCE STOCK.

Particulars of the same, with Form of Tender, can be obtained at this Office on application to the undersigned.

Tenders to be sent in not later than Twelve o'clock noon on Thursday, the 24th day of May, 1900.

By order,
H. WILKINSON,
Secretary and General Manager.

Gas Offices, Harrogate,
April 27, 1900.

ISLE OF THANET GASLIGHT AND COKE COMPANY.

TENDERS FOR £10,000 8½ PER CENT. ORDINARY STOCK.

THE Directors are prepared to receive TENDERS for £10,000 ORDINARY STOCK, such Stock to be paid up in full on or before the 17th of August, 1900, and to bear Dividend from that date.

A Deposit of 10 per cent. of the nominal amount of Stock tendered for must accompany each Tender, and half the amount of premium offered; the balance to be paid within Three Months after date of acceptance.

Any amount, being not less than £10, or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books, in the names of the Purchasers or their Nominees, free of expense. No Stockholder can hold less than £20.

Where no allotment is made, the Deposit will be returned; and in case of partial allotment, the balance of the Deposit will be applied towards payment of the amount due on allotment.

The Stock will be allotted to the highest bidders.

The Dividends payable on the Stock now offered for Sale by Tender are regulated by the Sliding-Scale, as set forth by Section 11, the Thanet Gas Act, 1898.

The Initial Price of Gas is 4s. 2d. Present Price of Gas is 2s. 6d. per 1000 cubic feet.

Tenders must be sent to the Chairman on or before the 17th of May, 1900, after which date no Tender can be received.

Forms of Tender may be obtained on applying at the Offices, The Dane, Margate.

By order,
THOMAS C. FULLER, Secretary.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the Shareholders, at their Ordinary General Meeting held this day, have declared a DIVIDEND of 6 per cent. for the Year ending Dec. 31, 1899, of which 2½ per cent. was distributed in October, 1899, by way of Interim Dividend, leaving the Balance of 3½ per cent. (7s. per share) to be paid forthwith free of Income-Tax; and Notice is Hereby Further Given to the Holders of Share Warrants to Bearer of this Company that COUPON No. 20 is payable by the Company's Bankers, Messrs. Prescott and Co., Limited, 50, Cornhill, London, E.C., at the rate of 7s. per coupon.

Coupons must be left with the Bankers three clear days for examination.

Notice is Also Given, that NEW COUPON SHEETS for Share Warrants (to Bearer) are now ready for delivery. Share Warrants (to Bearer) must be deposited at the Company's Office, No. 1, East India Avenue, E.C., for verification, between the Hours of Eleven and Two o'clock each day, except Saturday.

By order,
E. W. LAYTON, Secretary.

No, 1, East India Avenue,
Leadenhall Street, E.C.,
April 30, 1900.

BRIGHTON & HOVE GENERAL GAS COMPANY—£700 ORIGINAL ORDINARY STOCK. Last Dividend 1½ per cent.

SOUTHAMPTON GASLIGHT COMPANY—£750 FIVE PER CENT. CONSOLIDATED STOCK.

NORWICH UNION FIRE ASSURANCE COMPANY—10 £100 SHARES (£5 paid). Last Dividend £5 per Share.

IND, COOPE, & CO., LIMITED—100 £10 "B" 4½ PER CENT. CUMULATIVE PREFERENCE SHARES.

MESSRS. EDWIN FOX & BOUSFIELD will include in their next STOCK and SHARE AUCTION at the Mart, on Wednesday next, May 2, at Two o' clock, the above SHARES.

Particulars of the AUCTIONEERS, 99, Gresham Street, BANK, E.C.

THE Directors of the Colwyn Bay and District Gas Company invite TENDERS for the supply of from 3500 to 4000 Tons of screened GAS COAL, to be delivered free at Colwyn Bay Station during the Twelve Months ending June 30, 1901.

Tenders to be sent in not later than May 18, 1900, to William Earp, Esq., Chairman of the Gas Company.

J. C. PENNINGTON.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

WEST HAM GAS COMPANY.

NEW ISSUE OF 2500 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, May 2, at Two o'clock, in Lots.

Particulars of the SECRETARY of the Company, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ILFORD GAS COMPANY.

£10,000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1000 £10 NEW ORDINARY SHARES, & 15 £10 ADDITIONAL ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SAWSTON GAS-WORKS, CAMBRIDGESHIRE.

About equi-distant from Whittlesford and Shelford Stations on the Main Cambridge Line of the Great Eastern Railway. The Works are conveniently situate, and comprise Retort-House (with six Retorts), Coal-Shed, Purifier-House, Gasholder, Meter-House, Governor-House, Workshop, Large Yard, and Manager's House, together with the Mains; the whole to be sold as a going concern, and with possession on completion. Held for a term of about 70 years unexpired, at the nominal Rent of £1 per annum.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, May 8, at Two o'clock precisely.

Particulars of G. J. F. MUSKETT, Esq., Solicitor, 12, DOWGATE HILL, E.C., and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late W. H. H. Broadberry, Esq.

GAS AND WATER STOCKS AND SHARES IN THE

Tottenham & Edmonton Gaslight & Coke Company,
Southend Gas Company,
West Surrey Water Company,
Barnet District Gas and Water Company,
Romford Gas and Coke Company,
Horley District Gas Company,
Woking Water and Gas Company,
Harrow and Stanmore Gas Company,
Waltham Abbey and Cheshunt Gas Company,
Colney Hatch Gas Company,
Buntingford Gas Company,
St. Margaret's Gas Company,
South African Lighting Association.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, May 23, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CRAWLEY GAS COMPANY, LIMITED.

THE FREEHOLD GAS-WORKS SITUATE AT CRAWLEY, SUSSEX.

Conveniently placed close to the Main Road, within about a quarter of a mile of Crawley Station on the London, Brighton, and South-Coast Railway, and comprising Retort-House (with Eight Retorts), Two Gasholders, Purifiers, Scrubber, Coal-Store, Lime-Shed, Tar-Well, Meter and Governor House, Manager's House, together with the Mains to a length of about 5½ miles, Meters, Services, and Tools, the whole to be sold as a going concern, and with possession on completion.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, May 23, at Two o'clock precisely.

Particulars of the SECRETARY of the Company, at the Offices, High Street, CRAWLEY; of Messrs. HOLMES, LEAR, AND BELDAM, Solicitors, ARUNDEL; and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

ST. ANNES-ON-THE-SEA GAS COMPANY.

MESSRS. WILLIAM WILSON & SON have received Instructions from the Directors to SELL BY AUCTION, at the Room of the Manchester Society of Chartered Accountants, 65, King Street, Manchester, on Tuesday, May 8, 1900, at 3.30 o'clock in the afternoon prompt, subject to Conditions to be then produced, NEW ORDINARY SHARES sufficient to produce, with the Premiums thereon, the sum of £10,000, being part of the amount of £45,000 of Additional Capital authorized by the St. Annes-on-the-Sea Gas Act, 1898, and ranking for Dividend out of the Profits of the Company after the rate of Five per cent. per annum.

Particulars and Conditions of Sale may be had from Messrs. Woodcock and Sons, Solicitors, Haslingden; the Auctioneers, 29, Fountain Street, Manchester; and from the Secretary to the Company.

By order,
WILLIAM H. NUTTER,
Secretary.

Gas Offices, St. Annes-on-the-Sea,
April 24, 1900.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH N.B.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

BOLDON GAS COALS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton . .	10,500	Cub. Ft.
Illuminating Power . . .	16·9	Candles.
Coke (of good quality) . .	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

HARDMAN & HOLDEN, Ld.

ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.

Inquiries Solicited.

LONDONDERRY GAS COALS

FROM THE
LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	13$\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.

No. 1. No. 2. No. 3.

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Rich in Illuminating Power and Yield of Gas.

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TYNE
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
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The Directors of the old Company, who are the Vendors, will be Directors of the New Company, and will take 6000 Ordinary and 6000 Preference Shares as part consideration of the sale of the Undertaking.

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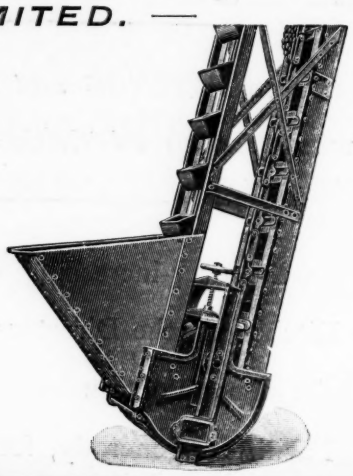

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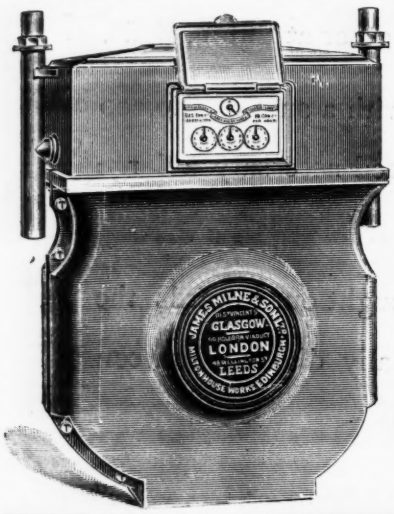

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It is well known that the only parts of an ordinary Tin-Case Dry Meter which are attacked by outside Corrosion are the bottom and the lower parts of the sides, and also the side tubes. In this Composite Meter, these parts are made either of Cast-Iron or Brass; and thus rapid deterioration is prevented, and the weight is not unduly increased.

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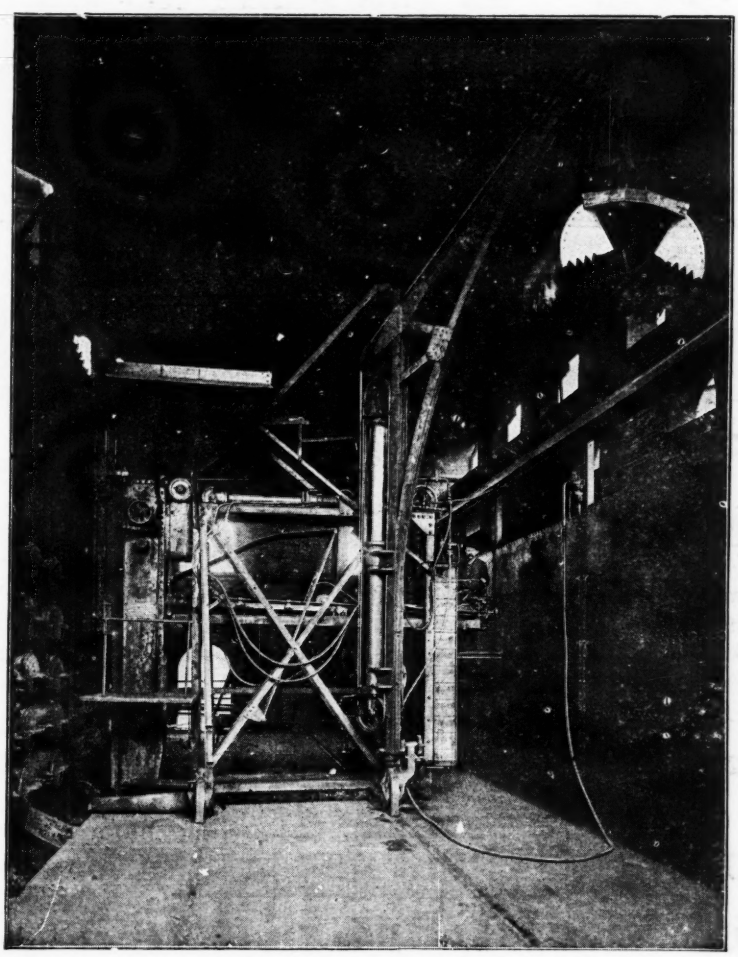

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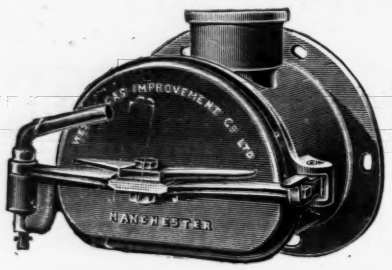

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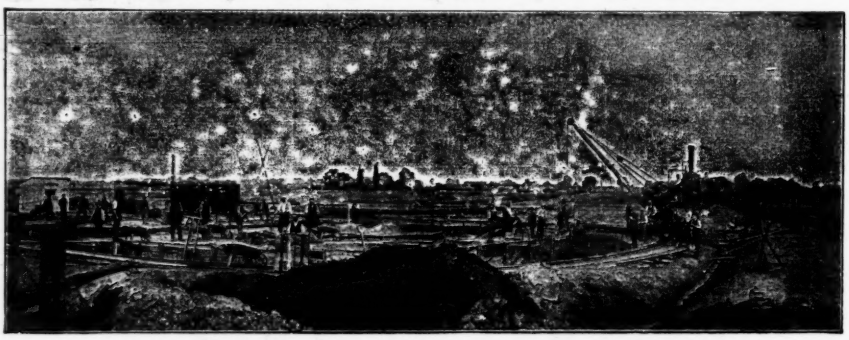

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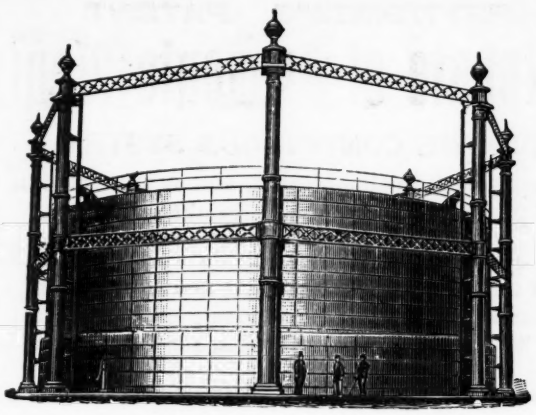

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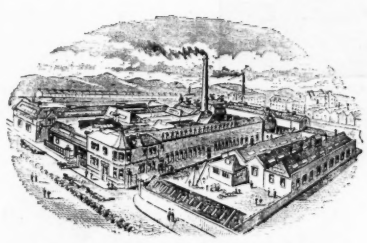

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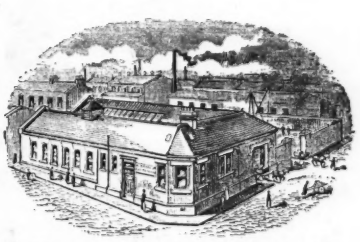

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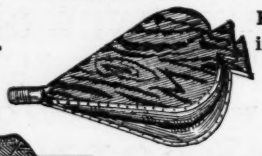

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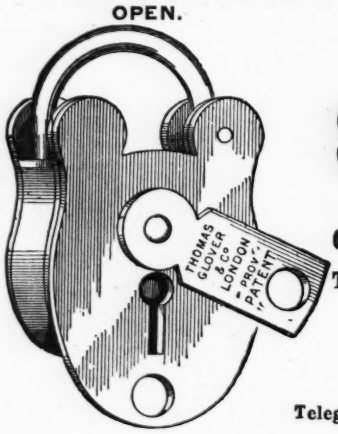

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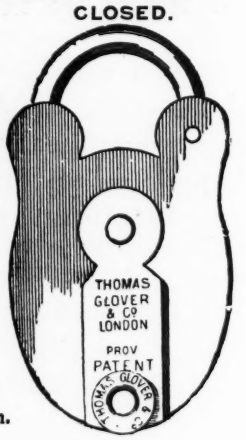

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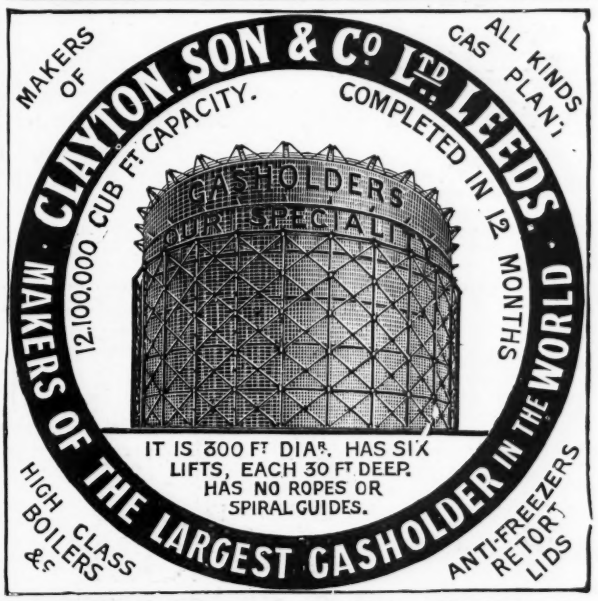
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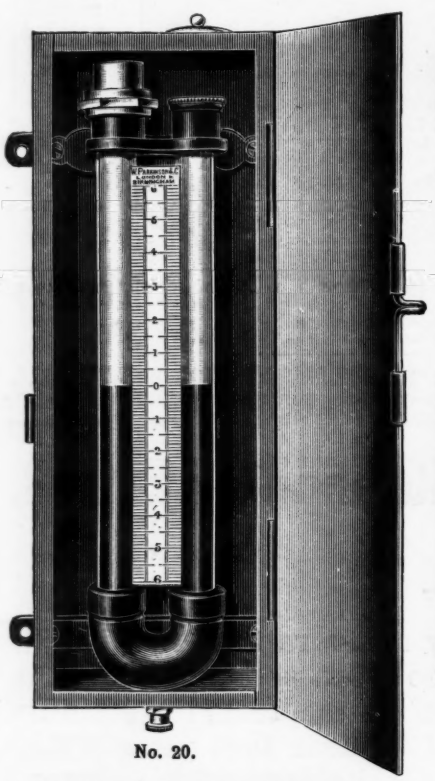

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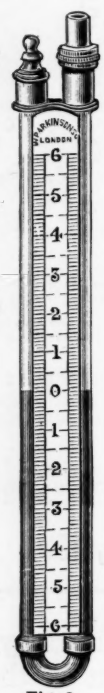


Fig. 2.

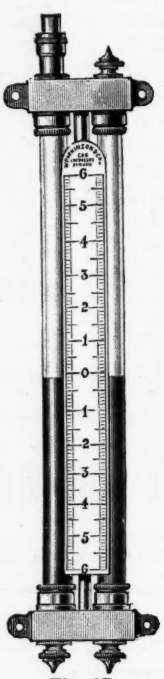


Fig. 3B.

Fig. 1.

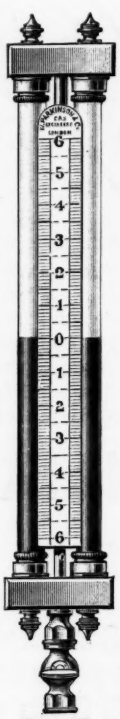


Fig. 5B.

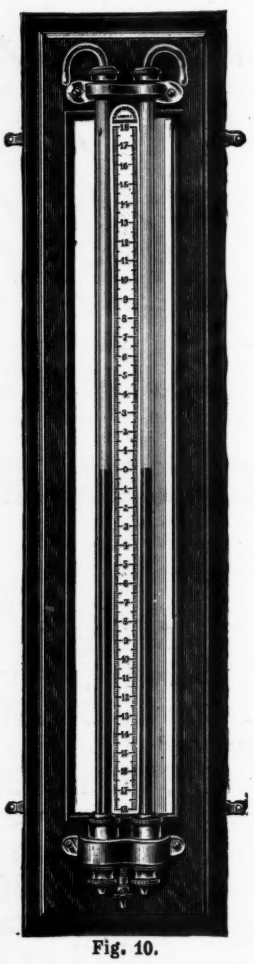
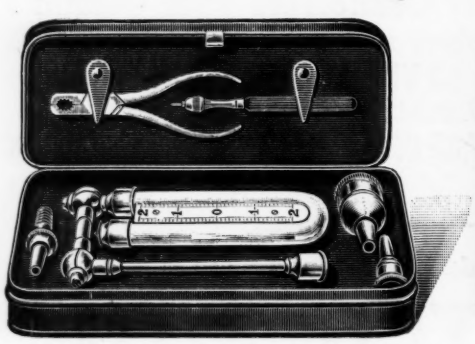
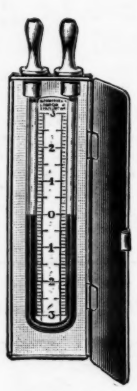


Fig. 10.





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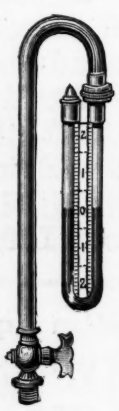
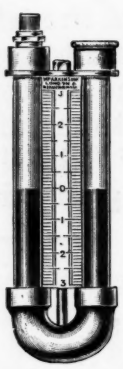


Fig. 6.



No. 28.

Fig. 9.

COTTAGE LANE WORKS, CITY ROAD.

LONDON.

Telegrams: "INDEX." Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,

BIRMINGHAM.

Telegrams: 'GASMETERS." Telephone No. 1101.

[See also Advt., p. 1104.

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